Rubber Journal and International Plastics

VOL. 139 NO. 17 OCTOBER 22 1960 Price 1s. Weekly

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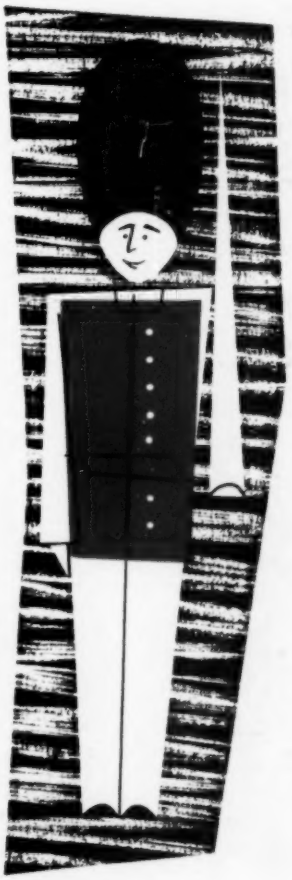

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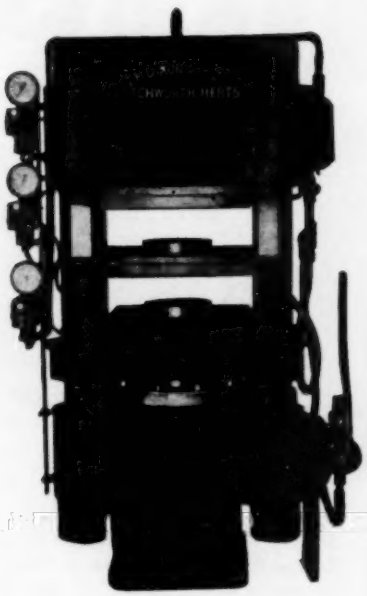

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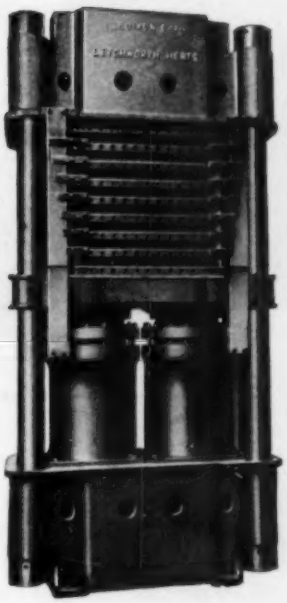

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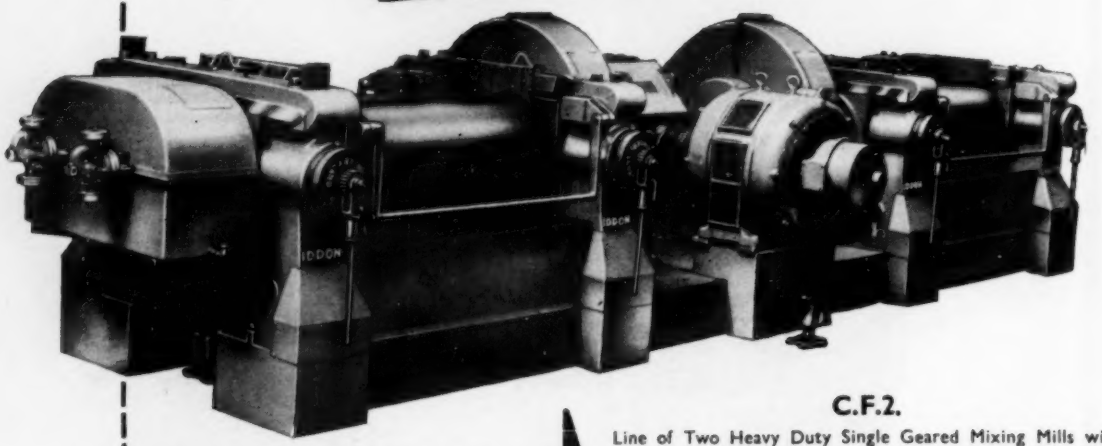

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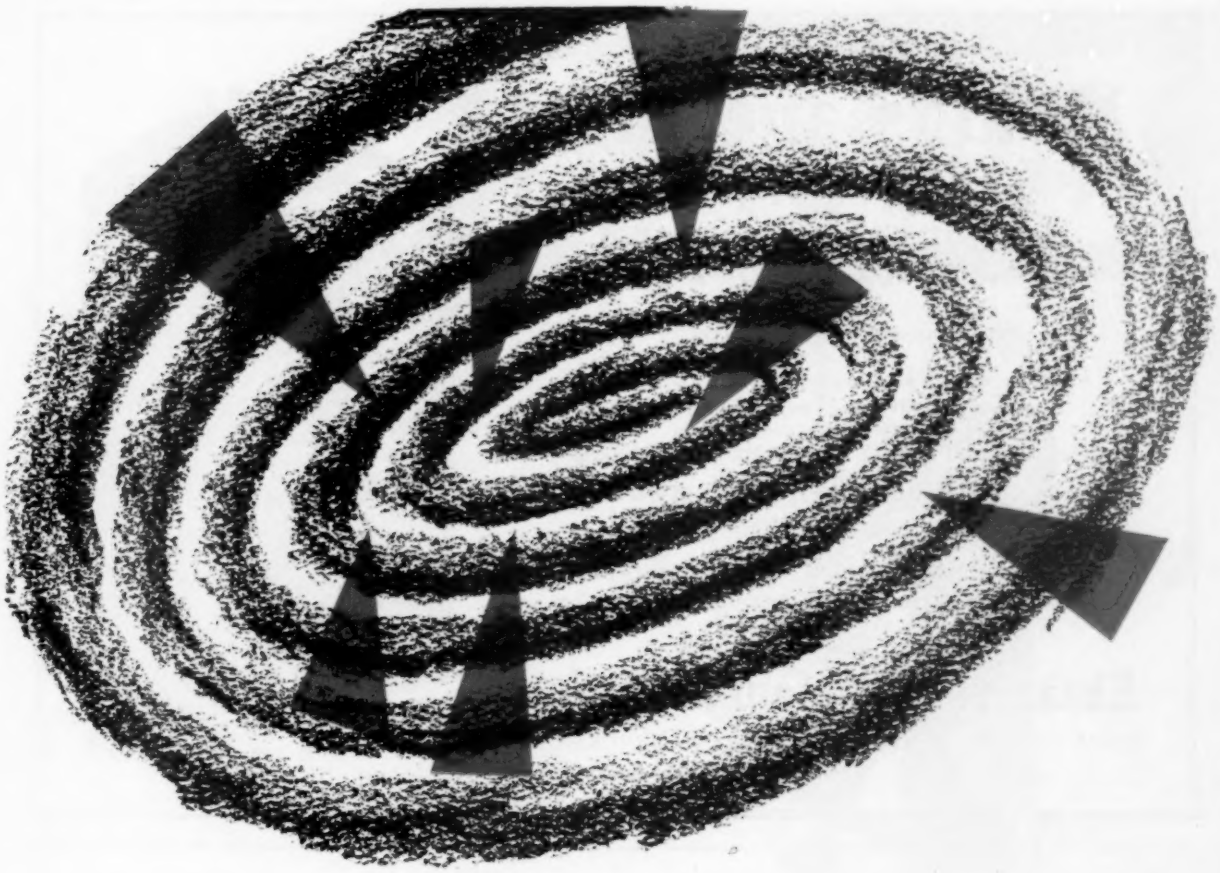

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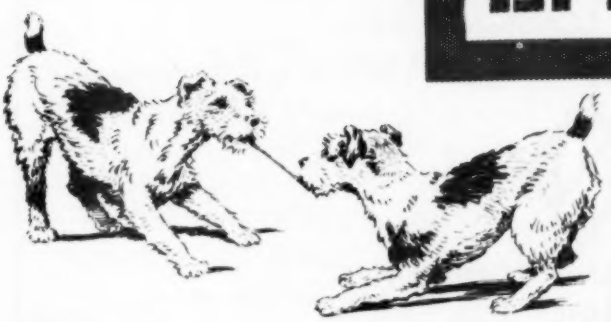

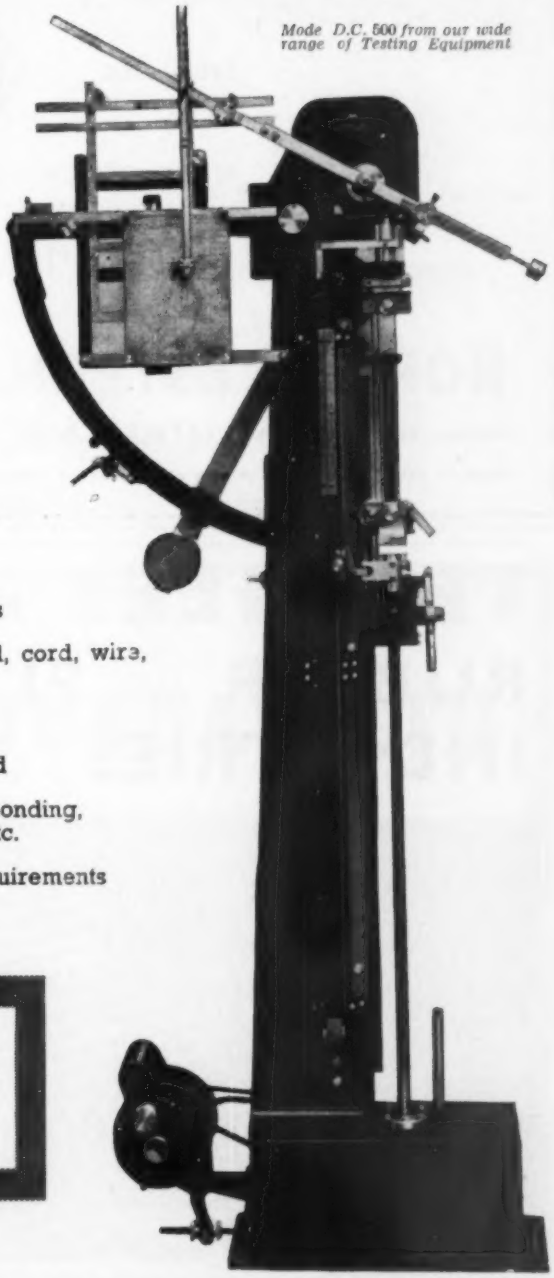

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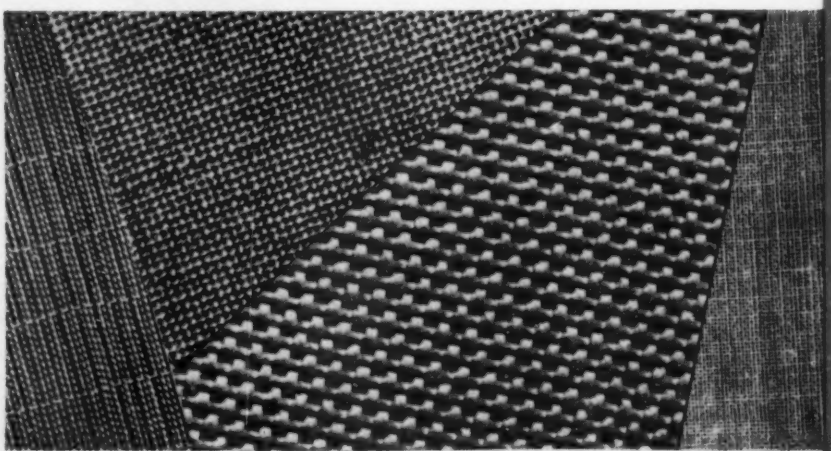

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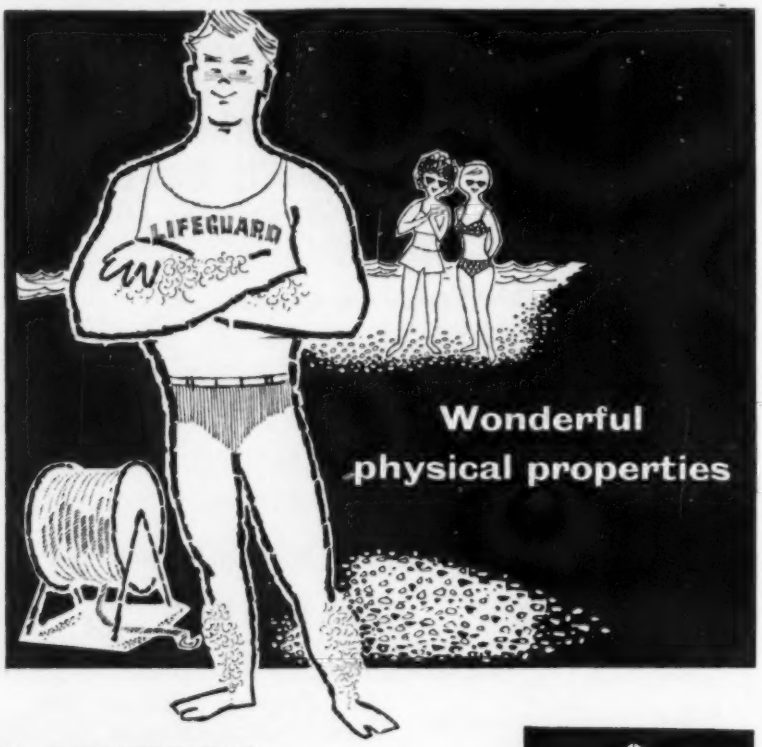

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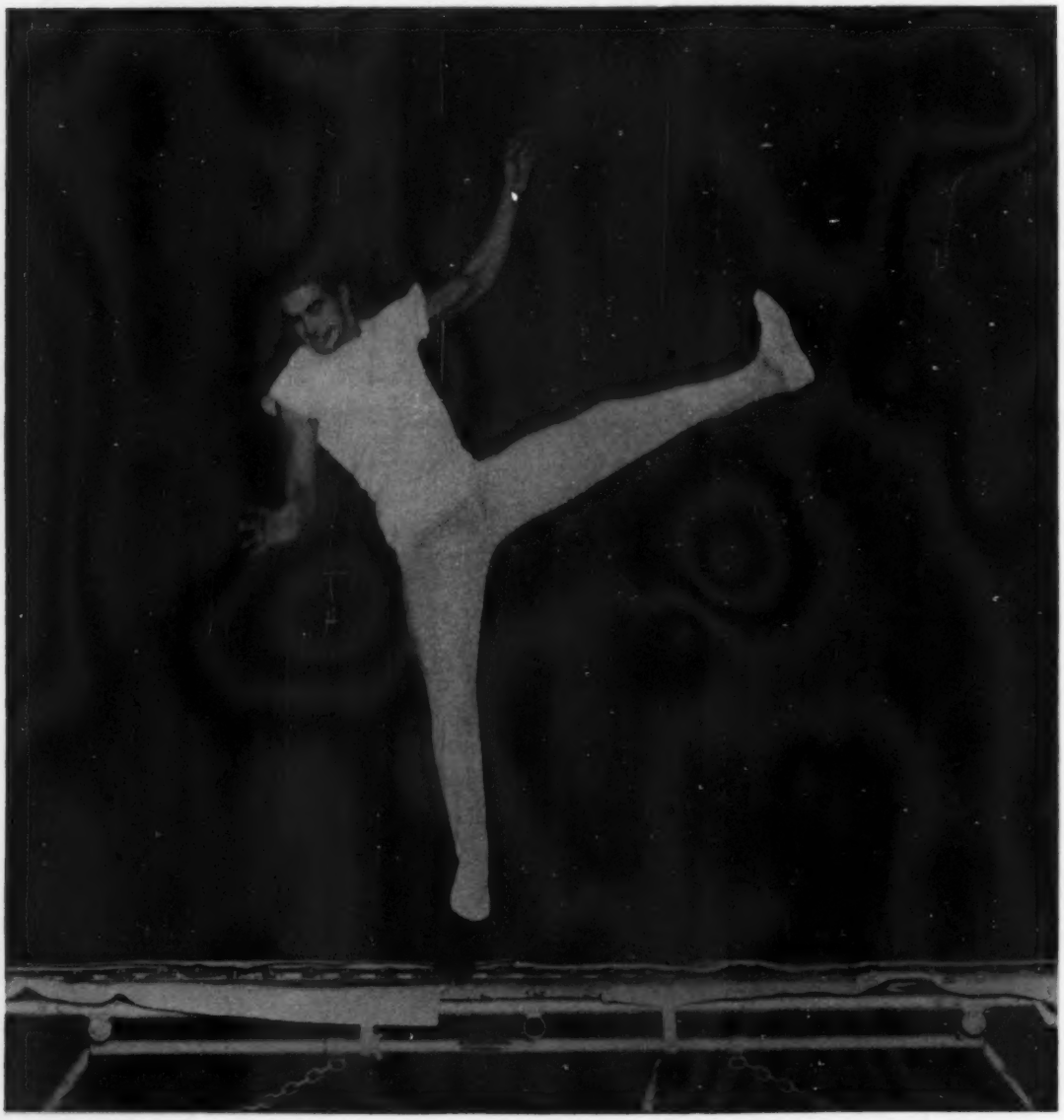

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IN ITS 77th YEAR

October 22 1960

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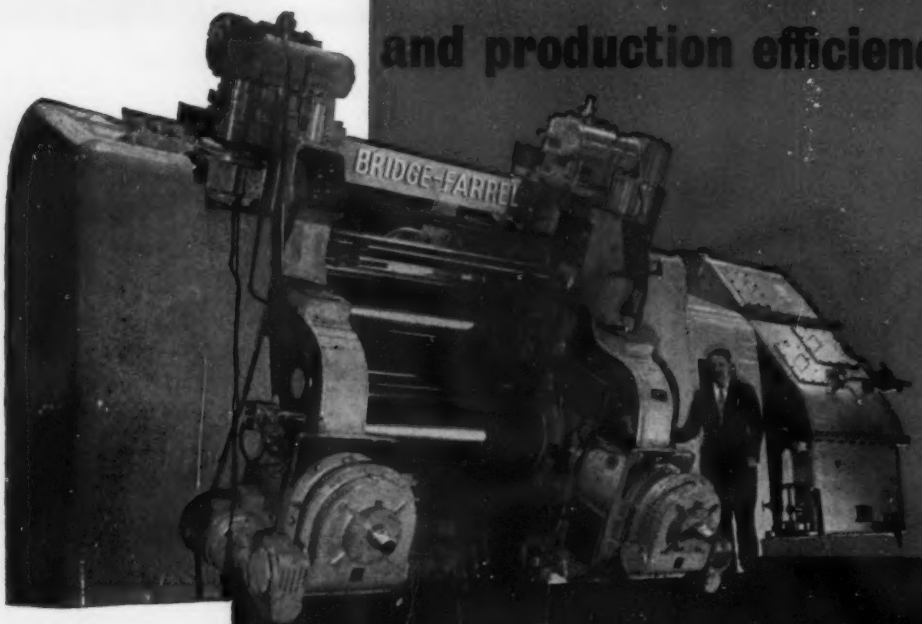

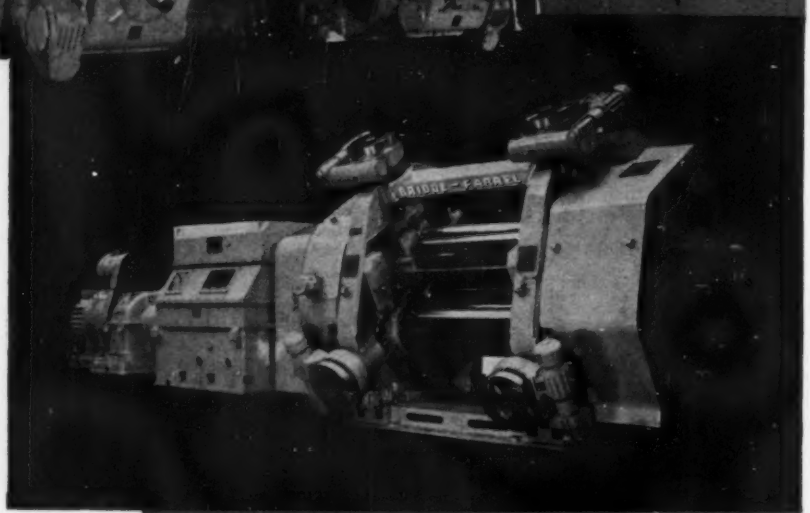

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NOTES of the WEEK

Naturally Good

WHAT must be set down as quite the most successful event of its kind closed on October 1. This was the Natural Rubber Research Conference held in Kuala Lumpur, Malaya. The standard, as well as the number, of papers presented was, indeed, impressive and was well met by a record attendance and some very smooth organizational work by the conference committee. The great range of topics—trace elements in the soil, tapping techniques, and latex composition to the design of rubber engineering components—stressed Professor Bonner's remark that 'There can be few industries whose research organizations need a wider spectrum of knowledge than does ours'. One of the most heartening results of the conference has certainly been the reporting of so much progress in so many aspects of rubber research.

A question that must for some time have been in the minds of many people was raised by Professor G. Gee (whose paper is reported elsewhere in this issue). Can natural rubber, even when produced in the most economical way possible, meet the challenge of the newer synthetics? Professor Gee answered it unequivocally. 'The qualities of natural rubber', he said, 'are so good that the expanding total demand for elastomers seems to me to predict for the foreseeable future capacity utilization of natural rubber at an economic price'.

A major contribution to the conference came from Professor G. E. Blackman, who described some new methods of stimulating the yield of the rubber tree. He quoted some striking statistics to illustrate the importance of this technique. In the past four years alone, he said, the extra rubber produced in this manner had been worth tens of millions of Malayan dollars.

Natural Plus Synthetic

IN the course of a masterly address at the final session of the conference, Sir Geoffrey Clay, Controller of Research, referred to mention by speakers of the striking results which could be obtained by blending natural rubber with synthetic rubbers. In this connexion he said that the position would soon be reached when 'the production of all types of new rubbers, including synthetic and natural, will be of a capacity which is more than needed to meet the new rubber requirements of the manufacturer. In the light of such a development, I cannot help feeling that research on the product, aimed at producing modified natural rubbers for particular purposes, possibly associated with the blending of natural and synthetic rubbers for particular uses, must be a major consideration in the policy on research into the product'.

In connexion with Sir Geoffrey's remarks, it is interesting here to recall the recently published results of tests by Chemische Werke Huls on natural/synthetic blends in tyre treads. This Company reports that a 50/50 blend of natural rubber and polybutadiene in tread rubbers has shown a 25% increase in abrasion resistance.

After reviewing and commenting on papers dealing with the agronomic aspects of the natural rubber industry; with those concerned with chemical technology, and with those on research on the fundamental properties of latex, Sir Geoffrey Clay said that it was apparent that if producers adopted the results of research; regularly replaced their stands by newer planting material, the natural rubber industry in Malaya had no need to fear competition from synthetic rubber. The figures cited by the Blackman Committee as the cost levels which the industry ought to aim at, were relatively easily attained. They were, in fact, being undercut by efficient estates with a high proportion of replanted trees giving yields of 900—1,200 lb. dry rubber an acre. (Incidentally, the Assistant Minister of Commerce and Industry, closing the conference, envisaged future yields of 2,000—3,000 lb. an acre a year).

At the end of his address, Sir Geoffrey Clay had a word or two to say about the price of rubber. The price, he said, which the manufacturer pays for his supplies of the natural product was not determined by the producer but was a function of the market. He thought the Minister of Finance not far wrong in a recent statement that 30d. (equivalent to M$1/07 or US cents 35) was just about right.

Paper Chase

THE past three weeks have seen a fair crop of conferences. Very successful, attracting members of the industry from all over the world, was the International Synthetic Rubber Symposium held in London earlier this month. A day or two before that, the British Plastics Federation held its biennial conference where, again, there were some excellent papers. This week, in Amsterdam—preceding the opening last Wednesday of the macroPlastic Exhibition in Utrecht—there was another conference on various aspects of plastics technology. Then in Berlin, almost exactly concurrent with the BPF Conference, there was the German Rubber Association's conference, once more internationally attended. Between them, these conferences produced more than 200 papers. It says a lot for the rubber and plastics industries that so many of their members were willing to set down the technology and general progress and good of the industries; and that so many more travelled considerable distances to listen and learn.

NEWS *Briefs*

ITALY AND USSR SBR/OIL DEAL—MORE SHELL POLYISOPRENE — MONSANTO IN FIBRES FIELD STOCK SALES—JAPAN TO DOUBLE PVC OUTPUT

Russia — Italy is to buy 12m. tons of Soviet oil within the next four years in exchange for Italian steel tubing and synthetic rubber. This 'largest ever deal in the history of Soviet-Italian trade relations' was concluded between the Soviet external trade State agencies and the Italian State concern, ENI. The Italian synthetic rubber deliveries to the Soviet Union will total 50,000 tons, according to the news agency Tass.

United States — What is said to be the world's most powerful very low frequency radio transmitter is being equipped with Permali densified wood laminate variometer and helix coil supports. The transmitter is now under construction in Maine for the US Navy. Structures have been fabricated by the American branch of Permali in co-operation with the parent company, Permali Ltd. of Gloucester.

Argentina — Imports of rubber and manufactures during the first half of this year totalled US$14,200,000, according to provisional figures (US$8m. in the same period of 1959.)

China — The Expanded Rubber Co. Ltd. (parent company British Xylonite) has received an order from Canton for 'Rubazote' expanded rubber.

Italy — Some 500 tons of natural rubber from the State-owned stockpile is being sold by public auction by the Transport Ministry.

Liberia — Two representatives of Guatemala's National Institute of Agriculture have arrived in Liberia for a three-month study of Liberia's rubber industry. They are key officials of Guatemala's new programme to stimulate rubber production. The soil and the climate conditions of Guatemala are similar to those of Liberia.

United States — Shell Chemical Co. has expanded its annual production capacity of polyisoprene to 40m. lb. with the opening of a new unit at Torrance, California. The company has announced plans to increase its capacity to 120m. lb. a year by the construction of an 80m. lb. per year facility near Marietta, Ohio.

Sweden — The Norwegian rubber company A/S Askim Gummivarufabrik of Oestfold is to establish a subsidiary company in Gothenburg, Sweden. The share capital will be between 150,000 and 450,000 Swedish crowns. The Swedish company will be established with a view to promote sales in Scandinavia in connexion with market changes caused by the EFTA.

Singapore — Preliminary ocean shipments of rubber from Singapore in September totalled 85,551 tons, according to an official cable.

United States — Monsanto Chemical is negotiating to acquire Viscose Corp.'s entire interest in Chemstrand Corp., the world's second largest producer of synthetic fibres. The offer is said to be for Viscose's 50% interest in both Chemstrand's stock and this company's subordinated notes, which are estimated to amount to $9.5m.

Argentina — Casein production has been helped by continued rains. Stocks are estimated at between 7,000 and 8,000 tons. Last week's reported shipments totalled 191.1 tons of which the United States took 93 tons, Finland 55.1, Italy 30 and Mexico 13.

Canada — A consortium of four companies is to develop asbestos deposits in the Baie Verte region of northern Newfoundland, at a cost of $18m. The companies are: Johns Manville, Patino of Canada, Amet Corporation and Financière Belge de l'Asbeste-ciment. The two latter are large European consumers of asbestos fibre. Production is expected to start by mid-1963.

United States — Firestone's new polydiene plant at Orange, Texas, scheduled for completion next January, will increase the company's synthetic capacity by nearly 12%. The facility will produce 30,000 tons a year; Firestone's present synthetic capacity is 251,000 tons a year at plants in Akron; Lake Charles, Louisiana; and Pottstown, Pennsylvania.

Japan — The PVC Industry Association says that production will be doubled in the next five years. 1960 production is put at about 260,000 tons; 1965 production, it is estimated, will be 517,000 tons.

'Bet you half a crown we don't get this order!' — 507

Geigy Open New Buildings

ADMINISTRATION, WELFARE AND LABORATORY BLOCKS

A LARGE new building complex of three blocks was officially opened in Manchester on October 14 by the Rt. Hon. Reginald Maudling, M.P., president of the Board of Trade. These have been erected at a cost of £800,000 on the site of the Ashburton Chemical Works Ltd., one of the Geigy group of companies and occupy some 2½ acres of the 20-acre site.

A general view of the new administration and laboratory buildings of Ashburton Chemical Works Ltd., opened on October 14

This group of buildings, very attractive in appearance, was started in 1956 and the welfare block was completed in 1958, while the laboratory and administrative blocks have been in use for about six months.

Filtered Air

The whole project has been carefully designed and provides complete air conditioning and heating facilities controlled automatically. Due to the very high level of atmospheric pollution prevalent in the area none of the buildings has opening windows and filtered air is supplied from the ventilation plant rooms on the roof. The laboratories are well equipped, embody many of the latest ideas in design and are claimed to be among the most modern in Britain.

Mr Maudling, in his speech, said that he was very glad to see a Swiss firm so firmly established in this country and felt that this was a good link between the largest and smallest countries in the European Free Trade Association which augured well for the future. He also thought that the fact that so much had been spent on these buildings showed that the chemical industry was flourishing and he was also very pleased to see that the accent was on welfare and research, both of which he considered to be of the utmost importance to the continued well being of the country.

Agency Advocated

A common marketing agency for natural rubber should be set up with its headquarters in Malaya, Mr A. Sundralingham, director of the Ceylon Institute of Scientific and Industrial Research, said last week. He said that all orders for the buying of natural rubber should come through the agency. The function of any such organization should be to sell rubber to the whole world. Mr Sundralingham suggested that the agency could be called the Federation of Rubber Producers. 'It could serve as an effective weapon against synthetic. Malaya should take the lead in forming such a body.'

Hoechst London Quote?

Farbwerke Hoechst says that it expects an application for an official quotation on Brussels Bourse to be granted 'in the late autumn,' in a letter sent to shareholders.

The German concern is also said to be considering applying for a quotation on the London Stock Exchange.

The Board of Trade is considering reimposing an anti-dumping duty on silicone fluids originating in France.

Standard Oil Protest

SPANISH PROJECT TURNED DOWN

THE Standard Oil Co. of New Jersey, has joined Compania Espanola de Petroleo SA in appealing against the Spanish Government's refusal to permit the two companies to set up a $10m. petrochemical plant in Spain.

A company spokesman said the appeal, filed with the Minister of Industry at Madrid, asked the Government to reconsider the proposal to build three petrochemical plants in northern Spain. The application for necessary Government permission was submitted to the Minister last May and rejected on September 2, the spokesman said.

CEPSA and Jersey Standard argued against the Government's contention that their proposed facilities would duplicate those of competitive applicants recently approved in Madrid. (This refers to the approved agreement recently concluded by Dow Chemical and Quimica del Norte de Espana SA, who are to build a petrochemical complex in Spain (*RJIP* September 3, 336).)

If approval of Standard's application is obtained, the company spokesman said, the two firms would form a partnership to produce and market more than 24,000 tons of petrochemicals per year. Included would be raw materials for the plastics and rubber industries. The ultimate investment in the overall petrochemical industry in northern Spain could reach $26m., he added.

Plastics Car

An all-plastics car — apart from a welded wire framework — was the central display piece of the US Society of Plastics Industry's stand at the Detroit Auto Show on October 15. It contained over 300 plastics components in common use, and illustrated the fact that 1961 US models contained an average of 22lb. of plastics, replacing 150lb. of metals.

Estimates at the Show were that by 1970 the US per car figure would rise to 60lb. of plastics — which would mean a car consumption of half a billion lb.

Synthetic Rubber Symposium

STEREO RUBBERS—ANIONIC POLYMERIZATION—CONTROLLING STRUCTURE

THE proceedings at the Second International Rubber Symposium last week were opened by G. E. Beharrell, Chairman of the Dunlop Rubber Co., and the International Synthetic Rubber Co. He said that the world consumption of rubber might well reach 5 million tons by 1970 and that the proportion of synthetic rubber being used was increasing and in 1960 would probably reach 45%. Intensive research was being carried out on cis-polybutadiene and cis-polyisoprene he said, which might be expected to replace natural rubber in some applications such as for large tyres for commercial vehicles. This could eventually lead to a material increase in the proportion of synthetic rubber used.

In conclusion Mr Beharrell said that the continued expansion in consumption and manufacturing capacity of the speciality rubbers, which had hitherto been more expensive than the general purpose types, might lead to cost reductions and new achievements in the development of unusual rubbers.

The Rt. Hon. Viscount Hailsham, Minister of Science, then made a typical and witty speech in which he welcomed all visitors from abroad (of whom there were more than 120) and expressed his pride in the scientific achievements of this country. There was, he said, considerable interest in synthetic rubber shown by industry and by the Government and he was sure that there was a great economic future for the synthetic as well as the natural rubber industry.

He welcomed the holding of the symposium and hoped that it would yield important scientific results. There was a great deal of secrecy in both the commercial and political fields, but it was his sincere conviction that the need for secrecy could be very much overdone and the advantages to be obtained from a frank interchange of ideas were often underestimated.

Overseas Speakers

Since of the nineteen speakers at the symposium only three were from British companies the interchange of ideas was perhaps a little one-sided in the lecture hall, but of course at gatherings of this sort as much value is derived by the meetings taking place outside as from the lectures themselves, and here no doubt the British contribution was much larger.

The standard of lecturing was high but none was better delivered than the first on the programme which was given by Professor C. E. H. Bawn, Grant-Brunner Professor of Inorganic and Physical Chemistry, University of Liverpool, who spoke on mechanisms of the stereospecific polymerization of dienes.

He reviewed the notable advances in the methods of polymerization of dienes by which the detailed molecular structure of the product might be brought under control to produce isotactic, atactic or syndiotactic polymers. He showed that the two main classes of stereospecific catalysts: (a) alkali metals and alkali metal alykls, and (b) Ziegler type combinations were similar in function, in that they were both ionic in character and that polymer growth involved stepwise insertion in a metal alkyl chain. He also discussed the mechanism of stereospecific polymerization and the influence of the polymerzation conditions on the structure of the polymer.

The effect of structural imperfections on certain properties of stereo rubbers was then discussed in a paper by Dr K. W. Scott, Head of Basic Research, Rubbers Section, Goodyear Tyre and Rubber Co. Minor amounts of structural imperfections, resulting from different modes of addition, of stereo polymerized diene rubbers had been found to have only negligible effects on viscoelastic properties but very pronounced effects on properties related to the formation of crystalline regions. The rate of crystallization was extremely sensitive to even minor amounts of structural imperfections. The tensile strength of rubbers was a typical crystallization dependent property.

Tensile strengths of gum compounds of a number of high cis-1,4-polyisoprenes were similar at low degrees of crosslinking; however the maximum tensile strength as well as the tensile strength at high degrees of crosslinking increased with the rate of crystallization of the rubbers at -25°C. in the following order: alkyl lithium - aluminium trialkyl/titanium tetrachloride - isomerized natural - natural. In addition to the amount of structural imperfections their disposition was also important. The melting point against composition behaviour of high cis-1,4-polybutadienes, prepared in a variety of ways, indicated that for certain catalyst systems the structural imperfections were introduced in a non-random fashion.

Anionic Polymerization

The first lecture of the afternoon session on the first day was given by Professor M. Morton, Director, Institute of Rubber Research, University of Akron, whose subject was Advances in Anionic Polymerization.

The use of soluble initiators of the alkyl lithium type had made possible a more detailed study of the kinetics and mechanism of anionic polymerization of mono- and di-olefins. Al-

The Rt. Hon. Viscount Hailsham speaking at the opening of the symposium and exhibition. With him is G. E. Beharrell, chairman of Dunlop

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though these homogeneous systems did not exhibit the degree of stereospecificity shown by the Ziegler-Natta type of catalysts, they were relatively simpler in mechanism, in that they showed no sign of any termination reaction of polymerizing chains.

Recent work had shown that the polymerization of styrene, butadiene and isoprene could, with suitable precautions, be carried out in these systems without interference by chain termination. This led to polymers having a very narrow distribution of molecular weights, but this distribution was very sensitive to the presence of impurities, or to other side reactions.

It had also been found that the anionic chain ends were strongly associated, in the absence of any solvating medium, such as ethers or tetrahydrofuran. Viscosity measurements on the polymerizing solutions and kinetic data indicated that the association of these macromolecules was generally in pairs, and that such chain-end pairs showed a much slower polymerization rate than the 'free' carbanions which exist in a solvating medium, such as tetrahydrofuran.

This association phenomenon was apparently general for the organometallic system carbon-lithium, and was present in all the cases studied, *i.e.* styrene, butadiene and isoprene. Hence the unique feature of the stereospecific cis-1,4-polymerization of isoprene must be due to the special steric factors involved in the entry of an isoprene unit into the region of the associated chain ends.

View of some of the exhibition stands. R. H. Cole featured the Strutkol range of rubber processing aids and I.C.I. (Nobel Division) examples from their full range of silicone products

Dynamic Properties

The paper contributed by a member of the staff of RABRM was on the dynamic-mechanical properties of filler-loaded vulcanizates by A. R. Payne who described recent work done on this subject at Shawbury.

Dynamic mechanical measurements were made on butyl rubber containing varying amounts of a High Abrasion Furnace black. The measured dynamic modulus, G*, decreased with increasing strain amplitude of deformation, and tan δ (the loss angle) increased from a value approximating to that of a pure gum rubber to a maximum at a critical point. The modulus changes were expressed in terms of G_0, the complex shear modulus at low strains and G_∞, the complex shear modulus at very high strains. The behaviour of the filler-loaded vulcanizates could be explained by these different mechanisms: (a) the effect of weak linkages due to carbon black structure; (b) the hydrodynamic effect of the presence of particles of carbon black; (c) additional effective cross-linking due to strong rubber-black linkages. Most of the modulus changes occured at strains below 0.5 and in strain regions to which rubbers were normally subjected to in service. The effect of HAF black was studied in other polymers including SBR, neoprene, cis-polybutadiene, some fluorinated materials and natural rubber.

The first day closed with a paper from Dr W. W. Crouch, Assistant Director of Research, Phillips Petroleum Co., on new controlled structure polymers of butadiene in which he said that an active area of research in many high polymer laboratories was the use of stereospecific catalysts to prepare polymers of controlled structure. Hundreds of polybutadiene elastomers had been made of widely varying cis, trans and vinyl structures. Four of these products had been selected for plant production or market development by his company. The product of greatest commercial interest was cis-1,4-polybutadiene of about 95% cis content. Due to its low heat build-up and excellent abrasion resistance, this material had given outstanding performance in tyre tread compounds. At least seven concerns now have plans to construct full-scale plants for the production of this type of rubber. Trans-polybutadiene of 85 to 90% trans content was another interesting polymer for use in hard rubber stocks. It was currently being marketed from a semi-commercial plant. Two other butadiene elastomers under market study included a 75/25 butadiene-styrene copolymer and an 80% cis-polybutadiene of interest in low temperature application.

Another interesting family of polymers included polybutadienes having chain ends terminated by reactive chemical groups. These 'telechelic' polymers reacted during vulcanization to tie the chain ends into the vulcanization network.

It was expected that these and many other new 'tailor-made' elastomers would be entering commercial production within the next few years as a result of the use of stereospecific catalyst systems.

(A report on the second day's papers will appear next week.)

Europlastica '61

From June 16 to 25 1961 the Ghent international trade fair organization will hold an international plastics exhibition — called Europlastica 61 — in close collaboration with the plastics section of the Belgian Federation of Chemical Industries, the plastics section of the Manufacturers of the Metal Goods Industry (Febrimetal) and the Belgian Plastics Syndicate. It will be held under the patronage of the Belgian Government.

This exhibition was originally planned for 1960 and was then postponed in order to permit each member country of the Common Market to organize exhibitions in rotation. Further information can be obtained from the Europlastica secretariat at the Palais des Floralies, Ghent, Belgium. The UK agent is M. Neven du Mont, 123 Pall Mall, London, S.W.1.

The telephone number of the London office of Turner Brothers Asbestos Co. Ltd.—14 Finsbury Circus, E.C.2 — will be changed to London Wall 5471 on October 31.

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OVERSEAS AGENTS THROUGHOUT THE WORLD

P4375

Recent Developments in Thermoplastics

GENERAL REVIEW OF MATERIALS AND PROCESSES

IN Western Europe over the last decade the plastics industry has been growing about twice as fast as the chemical industry, and three times as fast as industry as a whole. With this speed of expansion, it is important to keep the whole field in focus. A paper delivered at the British Plastics Federation Conference* at Scarborough helps to do this. Called 'Recent Developments in Thermoplastics,' it gives a valuable summary of the present position.

The joint authors were A. B. Glanvill, J. Hartley and Stuart Squires, all of Shell Chemical's Carrington Plastics Laboratory.

The growth of the plastics industry had been made possible to an important extent by the use of petroleum raw materials, the authors said. It was estimated that in the USA about two-thirds of the total plastics output was now derived from petroleum; this was in contrast to the situation in Western Europe where currently only about 25% to 30% of the raw material requirement was contributed by petroleum. Only vinyls still looked mainly to coal for their organic raw materials, and it could be anticipated that an increasingly greater part of the future raw material requirements for plastics would be obtained from petroleum as demand outstripped supply from coal and other sources.

Vinyl Polymers

Vinyl polymers—PVC, copolymers, polyvinyl acetate and the vinyls—had retained their dominating position among the leading thermoplastics; the free world consumption of vinyl polymers had roughly doubled over the period 1954 to 1958.

From the polymer side there had been the further trend towards 'tailor-making' for established and new outlets coupled with the aim to make processability easier. Thus in the PVC field there had been further improvements in the form of 'dry blend' resins, paste polymers designed for high or low shear working and the production of lower molecular weight polymers recommended for the injection moulding and calendering of unplasticized stocks in addition to floor covering and record manufacture. They had also seen the introduction of a new type of high impact PVC based on a blend of PVC and a chlorinated polythene of the same empirical formula. This material was available with varying concentrations of the two components and was of potential importance for pipe, bottle blowing and moulding.

In the extrusion field the growth of the rigid PVC pipe market was getting under way and the interest in vinyl sheet was becoming increasingly important. In the UK, the major changes in the consumption pattern during 1959 had been in the increase of PVC usage in slush and rigisol moulding, in domestic wire cabling and in the shoe industry.

Polyolefins

In the past few years the consumption of polyolefins had increased at a considerably faster rate than that of any other thermoplastic and they were now second only to the vinyls on a tonnage basis.

The most noticeable development in polythenes had been in the range of densities available. Until a short time ago it was sufficient to consider only the first two decimal places to specify the density, but the industry was now concerned with the third decimal place. Over the past two years the high pressure manufacturers had been gradually increasing the available density up to 0.940 either by changes in the catalyst system used in the polymerization or by blending with high density resins. The high density resin producers had achieved the lower densities down to 0.93 either by blending or copolymerizing with another monomer.

The practice of blending polymers had also been carried out by many moulding and extrusion companies. The reasons for doing this were partly technical and partly economic. In the moulding field it was invariably a question of rigidity of the moulding coupled with surface finish that had brought about this practice.

In the blown film extrusion field, increasing the density upwards from 0.918 had allowed the production of films of higher transparency and gloss coupled with a lower blocking tendency. The increase of density had also produced a stiffer film which had been easier to handle on overwrap equipment.

In the high density field the main outlet continued to be the moulding market where the materials were moulded *per se* or blended with the lower density resins for intermediate rigidity. The largest developing market was the bottle blowing and container field which appeared to be concentrating on the Ziegler 0.95 density polymers and the ethylene-butene copolymers.

The pipe market was slow in developing but should gather momentum when the BS specification was finalized and the price/material stress relationship was comparable with the lower density polymers. The monofilament field still represented a significant percentage of the market, but the other important fields of film, sheet and cable had not yet reached a significant level.

Polypropylene was still under market development and the main outlet at the moment was for mouldings where the gloss and surface hardness coupled with its ease of moulding in comparison with the new higher density polythenes assured it of a big future.

The other major developing fields were for cast film and sheet and staple and monofilament production. With the improvement in the heat and UV stabilizers available for polypropylene its uses would expand further into applications where good heat resistance and stability to outdoor exposure were important.

To date very little interest had been shown by the cable industry, but in the future it was anticipated that the low dielectric constant of polypropylene — especially in foamed coatings — coupled with its toughness and heat resistance, would allow it to take its place in this growing market.

Polystyrene

Although polystyrene consumption in North America virtually levelled off between 1954 and 1958 after earlier growth, consumption in the

*This conference was reported in *RJIP* October 15, p. 590.

remainder of the West almost doubled between those years.

In USA the impact polystyrene grades had an equivalent market to the general purpose materials, while the styrene-acrylonitrile and the ABS polymers currently represented 20% of the total styrene market and were making steady progress tonnage wise.

In the UK impact polystyrene took 40% of the total styrene market while the styrene-acrylonitrile copolymers and the ABS systems at the moment made up only 5% of the total.

The new polymers introduced into the styrene field over the past few years had been aiming at improving either their toughness, chemical resistance, heat resistance, outdoor stability, ease of processing or a combination of these properties.

The most significant introductions in the UK had been the styrene heat-resistant grades, the styrene acrylonitrile copolymers for enhanced chemical and oil resistance and the ABS systems for increased chemical resistance and toughness. In North America the styrene-acrylate copolymers and the methyl styrene acrylate copolymers had recently been introduced and these materials are claimed to have increased toughness and improved outdoor weathering characteristics. Other introductions have been the so-called antistatic grades, and the light stabilized grades.

Percentagewise the consumption pattern by grades had not significantly altered over the past two years except for the higher percentage of toughened grades now used. The toughened grades were used mainly in refrigerator, large mouldings and in the ladies' shoe heel market. The heat resistant grades were also making significant advances in the packaging and container field.

The outlets for foamed polystyrene were growing. The current markets in order of importance were board for thermal and sound insulation, and expandable bead destined for mouldings for the packing and container field where the general densities employed are in the 1-2lb. / cu.ft. range. The properties of the various styrene type polymers were compared (Table 1).

Of the other established thermoplastics, acrylics had made the major advances, significantly in the sheet and the moulding markets, especially for motor-car accessories, telephone handsets and television implosion screens.

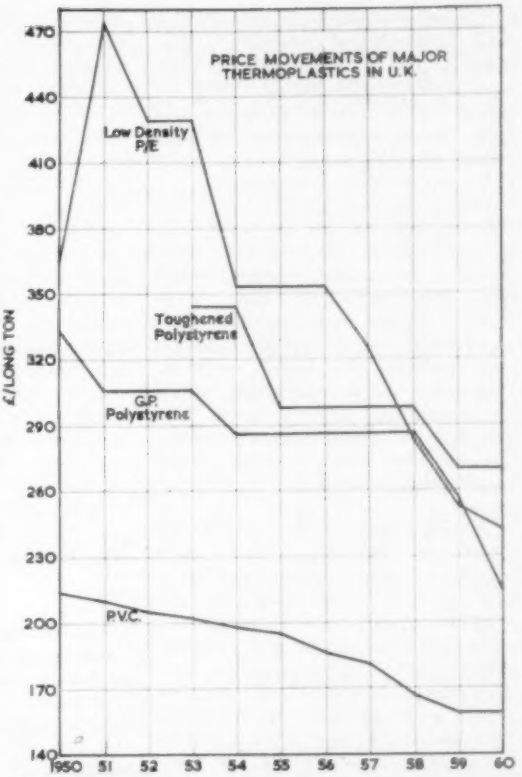


Fig. 1. The price trend of the major thermoplastics has been steadily downward over the last 10 years

Price Trends

The enormous growth-rates referred to should, it was said, be considered in conjunction with the downward price movements of the major thermoplastics over the same period (Fig. 1). These had been sustained by the raw material suppliers despite the immense research, development and technical service activities necessary in a highly competitive field.

Polycarbonates and Polyethers

The paper next reviewed new thermoplastics that had appeared over the past few years: polycarbonates, polyformaldehyde (or polyether) and the chlorinated polyethers.

Polycarbonates as typified by 'Makrolon' were transparent, had high impact strength, and a relatively high softening point in addition to

	General Purpose Polystyrene	Toughened Polystyrene	Styrene Acrylonitrile Copolymers	A.B.S. polymers	
				Cycolac	Kralastic
SPECIFIC GRAVITY	1·05	1·04	1·08	1·06	1·06
TENSILE STRENGTH P.S.I.	5–9000	3–6000	9–12000	3–7500	5–7000
ELONGATION %	1–2·5	7–60	1·5 – 3·5	10–140	10–140
FLEXURAL STRENGTH P.S.I.	9–16000	5–10000	10–16000	3–11000	8–11000
IMPACT STRENGTH Ft-lb/inch notch	0·2	0·4 – 2·0	0·3 – 0·6	3·0–10	3·5 – 9
ROCKWELL HARDNESS R&M Scale	M50–M85	M35–M70	M50–M95	R85 – R110	R98 – R113
SOFTENING POINT °C	85 – 90	80 – 90	90 – 105	97 – 100	95 – 100
PRICE x U.K.	23	29	48	51	57·75
PRICE + U.S.A.	21·5	28·5	42·5	49	58
VOLUME COST * U.K.	24·2	30·2	51·8	54·1	61·2
VOLUME COST * U.S.A.	22·6	29·5	46	52	61·5

x Pence per pound. + Cents per pound. * Volume Cost = Price (pence or cents / pound) X Specific Gravity.

Table 1. Properties of the various styrene-type polymers

	Polycarbonates	Polyacetals (Delrin)	Polymethyl-methacrylate	Styrene-methyl-methacrylate	Nylon	
					Type 6	Type 6/6
SPECIFIC GRAVITY	1·2	1·425	1·17 – 1·20	1·14	1·13	1·09 – 1·14
TENSILE STRENGTH P.S.I.	9–10000	10000	7–11000	9000	10–12000	7–11000
ELONGATION %	60–100	15 – 75	3–10	4–5	90 320	90
FLEXURAL STRENGTH P.S.I.	11–13000	14100	13–17000	17000	8–16000	8–13800
IMPACT STRENGTH Ft-lb/inch notch	12–16	1·4	0·3–0·6	0·3–0·6	1·0–3·6	1·0
ROCKWELL HARDNESS R&M Scale	M70	M94	M85–M105	M80	R103–R118	R111 – R119
SOFTENING POINT °C	approx 150	approx 110	approx 95	100	approx 145	approx 150
PRICE x U.K.	117	77	43	46	93	93
PRICE + U.S.A.	150	80	53	49	111	111
VOLUME COST * U.K.	140·4	109·7	90·3 – 51·6	92·5	108·1	101·2 – 106
VOLUME COST * U.S.A.	180	114	62 – 63·6	95·9	125·4	121 – 136·5

x Pence per pound. + Cents per pound. * Volume Cost = Price (pence or cents / pound) X Specific Gravity.

Table 2. Properties of polycarbonates, polyacetals, etc.

being self-extinguishing and having high dimensional stability. The material had a high melt viscosity necessitating high cylinder temperatures, high injection pressures and high mould temperatures, although mould shrinkages were of the same order as the styrene polymers.

Prices for this material were still high at about 9s. per lb. in the UK, but nevertheless interest was being shown in the material for coil formers and other electrical uses, crash helmets, lenses, machine and clock components. The authors thought that perhaps the most important application for polycarbonates would be in replacing die cast metal parts and in parts which normally contain a number of separate metal components which could be moulded in one piece.

Polyformaldehyde — better known under the Du Pont trade mark 'Delrin' — was a white opaque polymer of high crystallinity and was expected by Du Pont to supplement their line of nylon resins. 'Delrin' offered many useful properties such as hardness, toughness and durability. The current price in the USA was 80 cents per lb. and it was currently being offered in the UK at about 6s. 5d. per lb.

Like the polycarbonates, 'Delrin' was also being pushed in the die cast industry and was already cheaper than brass but still more expensive than zinc. Also on a lb./volume cost 'Delrin' was now cheaper than polycarbonates and nylon.

'Delrin' overlapped with nylon in some potential applications, such as bushing and gears, and if the price came down further, they were prepared to predict a big future for it in the general domestic and industrial mouldings market.

'Penton,' manufactured by Hercules Powder Co. Ltd. in the USA, was a chlorinated polyether and was characterized by good chemical resistance and dimensional stability coupled with relatively good moulding properties. The material was mainly being aimed at the anti-corrosive equipment market for use in the manufacture of valves, fittings and pump parts. It was currently a high cost polymer selling in the UK at 22s. to 23s. per lb. The properties of some of these new materials were compared in tabular form (Table 2).

Equipment

The authors considered some of the many developments in the plant field. 'In injection moulding and extrusion, and extrusion-based processes particularly,' they commented, 'the number of new technical features offered by the various manufacturers might now almost be felt to be embarrassing. However, many of these are really so recent as to make it impossible to put any final judgment on their success or usefulness, or to separate out the transitory novelties from sound development.'

Developments in general purpose injection moulding machines continued to follow the pattern of increased performance and capacity, together with the continued adoption of screw injection and preplasticizing equipment. Perhaps the most common development so far as extruders were concerned had been the continued steady increase in length to diameter ratio of the screw in order to process and homogenize efficiently the higher enthalpy materials — particularly the polyolefins. After considering further points in these fields, and in the field of blow moulding, the paper passed to film.

Film

In the low density polythene film industry tubular extrusion continued to be the main method of production but with intermediate and high density polythene and with polypropylene much work had been done with newer slit die film equipment. This, of course, was associated with the method of chill casting or quenching to produce maximum clarity. One difficulty which did exist with some of the chilled roll plants was the problem of cooling sufficiently fast at high production rates but new approaches should enable this to be overcome.

A greater difficulty was to produce commercial equipment for the biaxial stretching of slit die film at high production speeds, and which was necessary for film of the best properties. Some equipment had been developed for this purpose but generally these commercial plants were in their early stages.

A recently announced development in the USA was a high-clarity biaxially oriented polypropylene film having a special coating (believed to be a vinyl) which could be handled on high-speed overwrap machinery built for normal transparent cellulose. The coating enables heat-sealing to be effected without impairing the superior mechanical properties of the biaxially oriented film which would be ruined if the sealing were applied directly to the polypropylene.

The paper concluded that future technical developments in the plastics converting industries would certainly extend along the lines of existing trends and techniques.

'While no entirely fundamental changes in processing methods can be foreseen it would be foolhardy to say that none will come about. However at present one would expect the immediate future to be chiefly a period of stabilizing, evaluation, and digestion, with perhaps fewer novelties.'

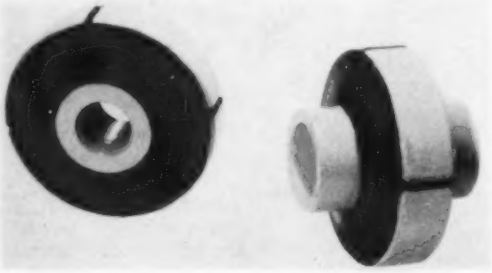
New Division for Phoenix

PHOENIX Rubber, of Slough, have opened a new division for producing rubber-to-metal anti-vibration units for all industries. The major application is in the motor industry, but these units can be used whenever a vibration problem occurs.

Components have been developed which have their special application as anti-vibration and noise insulation units in road vehicles of every kind, in locomotives and railway wagons, in ships and in aircraft.

Specially designed rubber-to-metal components for use in radio, television, radar and other sensitive units are being manufactured; further fields of application are air-conditioning plants, agricultural machines, machines used in civil engineering and domestic items such as spin driers.

Gesellschaft für Technischen Fortschritt MBH of Koblenz, who were one of the first companies to give serious consideration to the dynamic principles involved in anti-vibration systems, and who are one of the largest suppliers to the Continental car industry, are responsible for the design of the Phoenix components.



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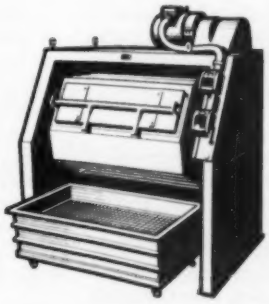

Sub-zero tumblers are available from Columbian International (Great Britain) Ltd., 116 Cannon Street, London E.C.4.

DK-333

Imperial Chemical Industries Ltd., London, S.W.1

New Methods of Elastomer Synthesis*

THEIR IMPACT ON NATURAL RUBBER

IN the history of the relationship between natural and synthetic rubbers, said Professor G. Gee at the Natural Rubber Research Conference, a number of phases could be recognized. The structure and properties of natural rubber remained mysterious for many years after its chemical composition was shown to be C_5H_8. Then the growth of polymer science led to an understanding of the essential nature of natural rubber, and to its recognition as a typical high polymer. The development of methods of polymerization led to the view that natural rubber would soon be synthesized.

Synthetic chemists then entered a period of disillusionment. The polymerization of isoprene gave polymers having the same overall chemical composition as natural rubber, but possessing physical properties inferior in every way. Moreover, the growing understanding of the structural requirements for an elastomer showed how well natural rubber was designed for this purpose. A nearly complete swing of opinion led to the view that no method was in sight for the polymerization of isoprene to a material identical with natural rubber.

The pendulum, said Professor Gee, had recently swung again. Claims had been advanced from several quarters for the synthesis from isoprene of a material identical in every way with natural rubber. Moreover, it was claimed that by the same methods butadiene could be converted to an elastomer superior in at least one respect in which natural rubber had hitherto been supreme. These two materials, separately or together, offered for the first time a total replacement of natural rubber for all purposes with the possible exception of latex applications. Since the latex foam market was independently encountering a severe and increasingly successful challenge from polyurethanes the opinion was once more abroad that the days of natural rubber were numbered. In his address, he said he wished to describe briefly the nature of the new developments and then to review some of the factors important in determining the relationship between natural and synthetic rubber.

From an address by Professor G. Gee, C.B.E., F.R.S., Sir Samuel Hall, professor of chemistry, University of Manchester, at the Natural Rubber Research Conference, Kuala Lumpur, Malaya. September 26-October 1.

Synthetic Natural Rubber

To understand what was implied by the self contradictory title 'synthetic natural,' the structure of natural rubber and gutta might be compared. Both were based on a large number of repetitions of the same repeating unit, but they were put together in two different ways, known to the chemist as cis 1-4 and trans 1-4. Nature was able — in different plants — to achieve either of these with almost perfect regularity. There were four other ways of joining up isoprene units, making six in all, and in some of the earlier methods of polymerizing isoprene, these six alternatives appear to follow one another without much regularity. It was really surprising that such a product should differ from both natural rubber and gutta.

In the polymerization process, molecules of isoprene were added one at a time, and the configuration of each unit in the final polymer was determined at the instant it joined the chain. The problem of producing a regular (or stereospecific) polymer was thus that of controlling molecular orientation in the propagation reaction. Two types of catalyst had recently been developed which showed this power in a marked degree. The simpler was lithium metal or a lithium alkyl, and was very effective in the conversion of isoprene to a polymer containing more than 90% of cis 1,4 structure.

A more generally applicable and powerful group of catalysts had been developed from the pioneer work of Ziegler. A typical member of this group was obtained by reacting Ti/Li with an aluminium alkyl. An astonishingly high degree of control of configuration has been achieved by selection of suitable catalysts from this group. The six possible polyisoprenes and the four possible polybutadienes had all been reported, in varying degrees of steric purity.

There were thus two sources of polyisoprene whose structure was claimed to be identical with that of natural rubber. There were, however, several reasons to question the claim to complete identity, but it seemed clear that they were extremely similar in stereochemical structure. They appeared to differ, from one another and from natural rubber, in molecular weight distribution. The molecules of a polymer were not uniform in length, and Ziegler catalysts generally produced a rather broad distribution, whereas lithium alkyls gave a narrow distribution.

Other New Elastomers

Apart from synthetic polyisoprene, natural rubber was now faced with potential competition from at least two other elastomers. One of these was polybutadiene. It was made in virtually the same way as polyisoprene, used a somewhat cheaper raw material, and was claimed to possess certain advantages which may offset its disabilities.

The other material was entirely different, being based on the copolymerization of ethylene and propylene, both very cheap monomers. Either when polymerized alone gave a crystalline, and therefore hard, nonrubbery polymer. Together however they could be converted to an elastomer which appeared to have good physical properties, and was claimed to be potentially cheap.

These problems, said Professor Gee, could be considered under four headings:

1. Could a material identical with natural rubber be made synthetically at a price below the cost of growing it?
2. Could polymers be made which were superior to natural rubber for applications involving large tonnages?
3. Could polymers be made at a low price which would be an adequate replacement for all or many purposes?
4. What, if anything, of a positive nature could be done to protect natural rubber against this many-sided attack?

Professor Gee went on to review briefly some of the general properties needed by an elastomer.

A substantially linear polymer of high molecular weight was needed. This was so because the elasticity of the material resided essentially in the long molecule. The polymer had to be processable, and it had to be vulcanizable. Then, for many purposes

Continued on page 701

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VIEWS and REVIEWS

THERE are times when we fail to understand the meaning of what the man-next-door says, so we must be doubly careful when the man-in-another-country speaks to us. This week I am reviewing some contributions to the French technical press and a word on the accuracy of translation is desirable.

The translations I am using are all my own and I take full responsibility for them. I have no particular reason for thinking them any more accurate than the next person's; and perhaps rather less than some for I have only a short practical acquaintance with France and the French. But I know they order things differently over there, which means that sometimes I have had to paraphrase to get across what I think is in the mind of the author; the French has nuances which are not easily rendered into English — a language of more precision.

For instance, ' Les matieres que l'on souhaite pour la fabrication des fils at des cables isoles ' is the title of a paper I propose to review, and we have nothing in ordinary, usual English to correspond exactly with the word ' souhaite ' and the phrase ' que l'on souhaite,' with all its implications in this context. A usual translation could be ' materials required for making insulated wiring and cables,' but ' souhaite ' is more than ' require,' it is also ' desire ' or ' wish for ' or ' want.'

And that is the very point I want to make about this paper. We rarely get the opportunity of finding out so easily but so reliably what our customers actually want.

Here is a complete analysis of the needs, satisfied and unsatisfied, of the cable-making industry as far as the suppliers of rubbers and plastics are concerned, together with an assessment of how far existing polymers fall short. We would all benefit by more papers of this kind, intelligently examining the needs and wishes of our customers.

Ideal Cable Coverings

So let me be quite colloquial and say that the title in English is: ' What the Cable Maker Wants.' It appears in the journal *Industries des Plastiques Modernes* for August/September 1960. Vol. 12. No. 7. Pp. 37-40.

The needs of the cable industry are constantly increasing, not only because of expansion in the general economy, but also because of the growing complexity of electrical installations of all kinds. More and more is being demanded of cables and wiring; the shortcomings of existing materials are getting more and more pronounced. The author, M. J. Bele, discusses these and indicates where progress is desired. He is the director of studies and researches in the department of insulated wiring and cables at Trefileries et Laminoirs du Havre.

Here is a brief summary of his approach.

After a table giving details of the consumption of various elastomers and plastics in the French industry during 1958 and 1959, he remarks: ' . . . compelled to use existing products, the cable maker rarely finds the material developed in a way to suit him. He is, therefore, naturally led, in order to get what he wants, to elaborate his mixes for himself and to devise his own formulations, just as he is often obliged to design and make his own machines.' He is forced to do this says M Bele with irony, ' not because there is any lack of problems.'

Insulated wiring and cables are found everywhere and consequently the influences which they have to resist ' cover the complete range of our universe.' He details them and classifies them as mechanical, thermal, chemical, electrical, biological, radiations, and ' finally, above all, humidity — that traditional enemy of all insulation, if not of all materials.'

All these influences, working together or separately, he calls ' le miliue.' Laboratory tests and specifications stand or fall by the accuracy with which their results can be translated into service expectations in the ' milieu ' for which the product is destined.

Problems of Cablemaking

Other problems and properties which the cable-maker has to consider are those arising from his processing methods, including mixing, extruding, and strip covering. Finally, there are cost (' taking into account the thickness, density, ease of working, and defects ') and the potentialities of the national market.

' If you wish, we will now review some of our special problems and formulate, in the course of examining them, several requirements covering the materials we are using.'

The general requirements are:

(1) Reduced thicknesses (while retaining good electrical and mechanical properties).
(2) Resistance to higher temperatures, in continuous or intermittent service, and momentarily because of short-circuiting.
(3) In special cases, retention of flexibility at very low temperatures, and resistance to certain chemicals.
(4) Ease of joining and repair.

Then, from these points of view, the author considers three main classes of materials: elastomers, thermoplastics, and new materials.

The elastomers include: natural rubber, SBR, neoprene, butyl rubber, nitrile rubber, silicones, and Hypalon. The thermoplastics discussed are: PVC, polythene, polyamides, polythene terephthalate, polycarbonates, polyurethanes, polyformols. He has a special word of approval for vulcanized polythene which shows ' compared with the usual polythene, superiorities in abrasion resistance and above all behaviour at high temperatures (short circuit) which open a vast field.'

He concludes with a plea for active collaboration between the laboratories and centres of special studies, the material suppliers, the makers, and the users of insulated cables. His own paper is a splendid example of the value of such a synthesis.

Polymers on the Road

A paper written from a somewhat similar standpoint appears in the same journal on pp. 28-32 and deals with the use of plastics in cars. The number of plastics components in cars is increasing steadily year by year:

COMMENT ON SCIENTIFIC AND INDUSTRIAL MATTERS

by **F. C. JENNINGS**

figures are tabulated showing over 200 parts per vehicle with a total weight of 15lb.

The authors of this paper (MM Chateau, Lagache, and Morriseau) limit themselves — unfortunately, I think — to how information about the properties of plastics can be brought to the knowledge of the car designer, and they deliberately avoid the approach of deducing from the properties how the material should be used. Such a service is important — I dealt with it in *Views and Reviews* September 24 1960 — but I would like to see the present authors come forward with a series of papers assessing the properties required in specific components of the vehicle and considering how far current materials measure up to these standards. As it is, they plead for detailed information of properties some of which are quite unnecessary in a number of applications.

For thermoplastics they ask for: elastic modulus at various temperatures, tensile strength at break at normal and high temperatures, plastic flow under load, resistance to impact at at least two speeds and at normal and low temperatures, ageing resistance, humidity resistance, chemical resistance, abrasion resistance, etc. They conclude with a brief consideration of thermohardening resins and especially of the curing of polyesters for which they have an interesting curve relating time, temperature, cross-linking, and viscosity.

Polyester Discussion

It is a common belief that from a technical lecture no real information ever emerges unless it be elicited by cross examination and forensic skill in the subsequent discussion. It would seem, on this basis, that there may be much more information than usual to be gleaned from the report entitled 'Polyester Resins' in *L'officiel des Matieres Plastiques* for September 1960, pp. 647-653, for it consists of a (deliberately) short lecture by M Fourcade, followed by a verbatim report of the quite lively discussion which followed. The lecture itself occupies three columns and the discussion ten. M Fourcade seems to have set out to stimulate inquiries, questions, even disagreements; and succeeded.

There are many possible polyesters arising from the choices of dibasic acid or alcohol and the kind of polymerized structure, molecular size, branching, etc. All are thermoplastic and a common and rapidly growing use for them is to convert them into thermohardening resins by the addition of styrene and then, with a glass-fibre reinforcement, to build them into hard, rigid, corrosion- and wear-resistant sheets and shapes, useful in several types of constructional work.

The styrene plays a double role, dissolving the polyester (thus facilitating the moulding of the sheets), and reacting at double bonds to form what is really a copolymer. M Fourcade says (my translation): 'In order that a polyester should have the best mechanical properties, it is necessary that this copolymerization should be carried to completion, it is bad, in my opinion, not to push the polymerization as far as it will go in order to get more flexibility, because there is then the possibility of premature oxidation and the risk of serious degradation of the materials.'

It is often useful to mix two different kinds of polyester but the choice must be made carefully because it is possible to make a bad mixture. Good mixtures frequently give results which are markedly better than the simple sum of the constituents because they form new compounds of the general type: polyester A-styrene-polyester B.

Among the polyesters under development by his company, M Fourcade said, 'is also another resin which will doubtless interest you, a self-extinguishing one. Its synthesis has been effected in the laboratory. I regret that it has not yet been produced commercially but that shortcoming will have been overcome in a few months' time.'

Elegant Plasticizing

The first part of the discussion concerned mainly the optimum proportion of styrene — it is possible to have too much as well as too little — the type of polyester is the chief governing factor and consideration must be given to both the ease of processing and the properties of the product. Then he dealt with compounding ingredients and, first, plasticizers, on which he had this to say: 'Some thinners (added to facilitate working) have a dangerous inhibiting effect. So far I have not clearly understood the interest in a plasticizer. The chemist can easily plasticize the chain, which is more elegant than adding an extra material which must ultimately be evaporated and lost. In the small sample which I exhibited there was no plasticizer. You could obtain the same product by adding 30% of plasticizer to a standard polyester. You would retain it for a week, at the end of a month, the flexibility would have disappeared, at the end of three months it would have returned to its initial condition.'

For other compounding ingredients, the author recommended silica and carborundum, and spoke of the danger of copper impurities.

Another part of the discussion concerned the best process for polymerizing. The lecturer was opposed to radiation- and high-frequency-curing, and spoke of the need to determine the best time and temperature by actual experiment taking special note of the humidity. This led on to an exchange of views on the relations between physical properties and the degree of cross-linking.

The discussion ended by trying to define a suitable test of heat-resistance and a measure of combustibility.

I have sought to indicate the scope of this report rather than to reproduce its details, in the hope that the expert will consult the original. There is no doubt that far more valuable information was brought out by this method than by the formal type of lecture.

Low Temperature Problems

Heywood and Co., of Russell Street, London, have just announced a new journal dealing specifically with problems of low temperature. It will be called *Cryogenics*, be issued quarterly for an annual subscription of £5, be international in scope, authority, and editing, and make a feature of 4-language summaries of its fundamental papers. It will publish papers on cryogenic propellants such as rocket fuels, new methods of handling, storage, and transport, low temperature electronics, and other technical problems related to cryogenics. No doubt it will contain matter of interest to high-polymer scientists.

CHARLES JENNINGS

MEN *and* MATTERS

A Review of People and Events

by Peter Richards

ABOUT 70,000 words of news and features flow from the Central Office of Information at Lambeth every day, presenting Britain to the world. A good proportion of this is material about British industry — and the CoI feels that a good proportion of this is not up to standard.

An appeal for better quality publicity to support the export drive was made recently by Charles Hadfield, overseas controller of the CoI. 'We are getting lots of stories as a result of the approaches we have made to industry and we are making good use of them,' he said. 'What we need, of course, is a constantly rising standard of material — stronger stories and special articles directed at individual territories. The aim is to make an increasing impact with industrial news in all our publicity media.'

He was talking to directors and public relations officers of manufacturing companies and public relations consultants — including Robin Goodfellow of George Angus, Mrs Asta Brewster and Peter Gomm of Goodyear, and Miss L. E. Spencer of Frederick Braby. They all visited the CoI to study the operations by which the achievements of British industry are publicized overseas. The office's output, which includes the written word, photographs, displays, films and radio tapes, is used in over 100 territories.

Banana Sponge

Yes, we have no bruised bananas in Jamaica — not since latex has been protecting them.

A local source on the island says that an experiment in which rubber foam mattresses have been used on the banana handling tables instead of the usual banana 'trash' has been very successful in reducing scarring and bruising of the fruit.

It is understood that this new method of handling is to be adopted generally as part of the drive to deliver fruit to the United Kingdom in tip-top condition.

Mud Sponge

A plastics firm stepped in to help the Devon flood victims recently with a welcome but unusual gift. Two thousand large-size plastic sponges were rushed to Exmouth to help householders with cleaning-up operations after the previous days' disastrous flooding.

The sponges were given to the county welfare services officer by Kay Brothers Plastics (one of the Reckitt and Colman group of companies). They were sent from their Marple works late on Tuesday October 11 to the Exmouth WVS headquarters for distribution. Exmouth council had discovered the previous day that 1,000 homes had been affected by the flood waters locally and the Devon branch of the Red Cross Society had appealed to national headquarters for more emergency drying and cleaning materials.

The sponges were off-cuts from lengths of Foamoprene expanded polyurethane normally used for upholstery and packing purposes. The pieces — all the colours of the rainbow — added a touch of brightness to the mud-bespattered homes.

New Dunlop Post

A new senior position has been created in the overseas division of Dunlop by the appointment of A. E. Durling as overseas sales manager.

Previously manager of the African and Middle East department of the company, Ted Durling began his career in the motor industry in 1932 with the India Tyre and Rubber Co., Scotland, where he was responsible for developing tyre mileage contracts. He joined Dunlop overseas division in 1945.

Mr Durling has travelled widely in European, Middle East and African markets. In his new capacity, he will be primarily concerned with tyre exports and will have his headquarters in St. James's House, London.

Catalytic Promotion

David B. Ardern of Wallingford, Pa., has been made executive director of the new catalyst company in Marl, West Germany, jointly owned by Houdry Process Corporation of Philadelphia and Chemische Werke Hüls of Germany (*RJIP*, Oct. 15, 566).

Ardern, who leaves his post as director of technical service at Houdry will be one of three executive directors of Katalysatorenwerke Houdry-

Recently Du Pont (UK) Ltd. entertained 60 representatives of the Italian rubber industry who flew in from Milan to visit the company's elastomers research laboratory at Hemel Hempstead. In charge of the party were representatives of the Italian distributors of Du Pont elastomers, Societa Italiana Elastomeri S.p.a., of Milan. Sitting at the front are (extreme left) W. P. Fletcher (assistant sales manager, elastomers) and S. W. McCune III (general manager), Du Pont (UK). In the middle on the left is Russel A. Kurtz (marketing manager, elastomers), Du Pont International SA, and on his right Dr G. Brunelli, of Societa Italiana Elastomeri S.p.a.

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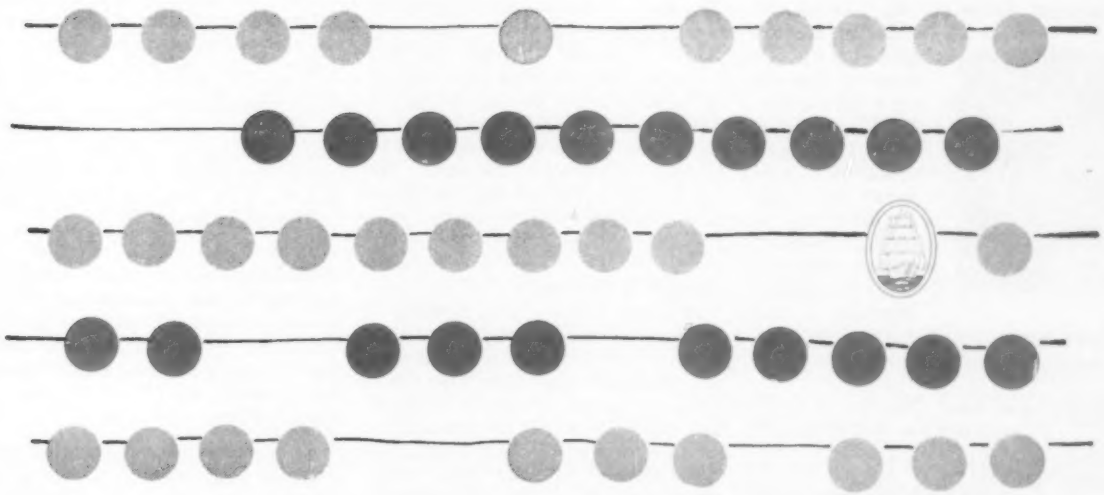

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Hüls, GmbH. This new company will develop, manufacture and sell catalysts in the Western European market. I understand that, in addition, Mr Ardern will act as Houdry's process sales representative in Europe. He has been with the company for 18 years.

Hüls will appoint two executive directors to join Ardern. These three men will manage the new company.

Some Territory

Polymer Corporation of Sarnia has appointed Neil B. Roberts area sales manager, Europe. Mr Roberts, as technical sales representative, has been in London since 1956 under S. C. Kilbank, whom he succeeds. Mr Kilbank has been assigned to a special project. A graduate of Sydney University, Australia, Mr Roberts came to England in 1949 and joined Polymer three years later.

Burtonwood Sales Director

H. V. Rowlands has been appointed sales director for Burtonwood Engineering Co.

Mr Rowlands, who is 60, joined the company in 1930 and became a member of the board five years ago. In 1954 he was responsible for forming the Plastics Division, which has rapidly expanded until now, of course, it is one of the most important divisions of the company.

London Rubber Celebrates

Industrial unrest has been a familiar part of life in Britain since the war. Yet, as is always the case, we only hear of the discontented patches of industry, never of the more contented ones.

This thought occurred to me at the annual staff dance the London Rubber Co. gave to its manufacturing division employees last week. Over 800 people gathered together in the Assembly Hall, Walthamstow, and all of them looked to be having a thoroughly good time, when dancing themselves, and when looking at a cabaret of formation dancing. No sign of unrest in this company, which at the moment employs about 2,600 people.

Blowers to America

Granbull Tool Co. — a member of the Baker Perkins group — announced recently that they have signed a sales and manufacturing agreement with the US concern Prodex. Granbull will supply certain basic components in their range of blow moulding equipment to Prodex who have already placed an initial order in excess of £40,000 for components.

Prodex is one of the leading extruder manufacturers in America, and it is certainly something when a firm like this should come to the UK for its bottle blowers. It goes to show that, providing you have quality goods, they can enter any market.

* * *

The directors of Bridgeport Brass Ltd. — newly formed UK subsidiary of the Connecticut tyre valve firm — are Austin R. Zender; James F. Donnelly (general manager); John S. Dawson (secretary); Warren J. Faust (treasurer); Drummond C. Bell (controller) and David Fulton, Sen. (general manager).

* * *

More than a hundred members of the Midlands motor trade took part in the third annual Vitafoam golf tournament last month at the Shirley Golf Club, Birmingham. The best net score was registered by Don Lockwood of Humber.

* * *

Metalastik's new chief inspector, E. Gregory, has had wide experience of inspection and design in the marine, aircraft and motor industries. For 15 years he was with Vickers-Armstrong.

* * *

E. Bowker has been appointed sales manager to the general rubber goods division of Dunlop, at Cambridge Street, Manchester. He has been with Dunlop for 29 years.

Question Corner — 140

(Second Series)

465. What are the properties most desirable in a polythene resin when used for paper coating?

(Answer next week)

Answer to Question Corner — 139

464. There are several types of heat sealing machines now available but in all cases these factors should be considered:

(a) Large changes in melt index have comparatively little effect on the time and temperature limits of satisfactory sealing, but lower melt index resins have a wider operational range than high melt index resins.

(b) The treatment of the film for printability does not decrease heat sealability, provided over-treatment has not occurred.

(c) The clamp time required to make a good seal drops considerably as the temperature rises, but more care is needed when sealing at high temperatures than low ones.

(d) More flexibility is obtained at low temperatures than at high ones.

(e) The fabricator obtains higher output with short clamp times and also, as the machine is operated, heat builds up in the unheated foot or base and this effect is greatest with long clamp times, and can be quite large. This, of course, narrows the working temperature range.

(f) The clamp time or bar temperature, or both, required for sealing fall as the sealing pressure is increased.

(g) A gusseted bag requires a longer time for sealing than an ungusseted one. Attempts to seal gusseted bags at high temperature and pressure may reduce the safe sealing time range to an extremely short time interval. It is desirable to keep pressures as low as possible when heat sealing gusseted bags.

(Another question next week)

Polly Ester Says . . .

'Catalyst — my lop-sided pussy'

NEW METHODS OF ELASTOMER SYNTHESIS

Continued from page 694

the vulcanized rubber must be highly elastic. A measure of the extent to which it can store energy reversibly was provided by its resilience. A rubber of low resilience dissipated much of the energy imparted to it in deformation as heat. If such a rubber was used for tyre treads it would become hot in service, and its life would be impaired. Until recently natural rubber was supreme in this respect, but its place had now been occupied by polybutadiene. The use of natural rubber had been essential in heavy duty tyres. Not only could it now be replaced by synthetic polyisoprene, but still cooler running could be obtained by use of polybutadiene. Perversely, just at this time claims were being made for the use of butyl rubber in passenger car treads, its low resilience giving quieter running and better stopping power, albeit at the expense of hotter running and increased fuel consumption.

The vulcanizate must also be strong. Professor Gee used the word broadly, to cover such properties as tensile strength, tear resistance and abrasion. A polymer failed mechanically when all the molecules in a certain cross-section broke. If the breaking process occurred serially, the rubber would be weak, since the breaking stress was applied to a progressively diminishing number of strands. To achieve high strength the stress should be distributed as uniformly as possible over the cross-section, *i.e.*, the individual molecules must be enabled to co-operate. This occurred when the polymer crystallized, *i.e.* molecules packed together in a regular pattern. Natural rubber showed very favourable behaviour in this respect, crystallizing well in stretching, and it was to this that its high tensile strength in gum compounds was to be attributed. It would be difficult, though not in principle impossible, to match or even surpass this quality of natural rubber.

A very general alternative method of achieving high strength was by incorporation of a reinforcing filler, generally carbon black. This served to link the molecules together, and at the same time increased the elastic modulus to a value which cannot be obtained in a natural rubber gum compound without loss of strength (due to absence of crystallization). The tendency of reinforcement to fail at high temperatures still confers a premium on crystallizing rubbers.

This was an extremely important field, which was as yet imperfectly explored or understood. Natural rubber compared favourably with any present challenge in gum compounds, but in tread compounds was much less secure. Tread wear ratings for polybutadiene were claimed to be markedly superior.

Finally, adequate ageing resistance was important, although the use of chemical protective agents could greatly mitigate the deleterious effects of heat, light, oxygen and ozone. The chemical unsaturation of natural rubber put it at a disadvantage in relation to a number of its competitors.

Possible Modifications of Natural Rubber

It had often been suggested that natural rubber could meet the synthetics on their own ground if it were used as a raw material for chemical modification. Professor Gee did not believe the type of major modification usually envisaged to be a useful objective, natural rubber furnishing an expensive and inconvenient raw material for such a purpose. Minor modifications were greatly to be encouraged and were well illustrated by SPR, PA 80 and by BRPRA's low temperature rubber.

An important field for study was the blending of natural rubber with other materials, both elastomers and plastics. The use of elastomer blends was already common practice; the processing problems of polybutadiene were largely overcome in 50:50 blends.

There was an inherent difficulty in blending polymers, arising from their very small tendency to mix on a molecular scale. This whole field deserved much more study including possible minor modifications of natural rubber to introduce groups capable of interaction with the polymer to be blended. Very striking results had been obtained by blending other polymers; the position of natural rubber should be carefully considered.

Natural Rubber's Future

Professor Gee said that from a physico-chemical or technological standpoint, the future position of natural rubber must be that of one of a range of elastomers. The scope of its modification must be less than that of synthetic materials, and it would be foolish to assume that the full strength of the future synthetic challenge could yet be assessed. He concluded, ' Its qualities are, however, so good that the expanding total demand for elastomers seems to me to predict for the foreseeable future, capacity utilization of natural rubber at an economic price. I believe that the correct policy for the industry is a competitive — collaborative relationship with manufacturers of synthetic polymers and the closest possible liaison with elastomer users.'

Plastics and Corrosion

The Plastics Institute is holding a symposium in the Empire Restaurant Hall, Olympia, London at 2.15 p.m. on Tuesday November 29, the opening day of the Corrosion and Metal Finishing Exhibition.

The papers that will be read and discussed are: ' Protective packaging — engineering applications ' by D. Gonda (technical director, EPS (Research and Development) Ltd.); ' Plastics as heavy protective coatings ' by N. Vinson (managing director, Plastic Coatings Ltd.) and ' Fabricated plastics and their role in combatting corrosion ' by D. W. Shorten (head of technical service department, fabrication, BX Plastics Ltd.).

Take It With You TV

At the recent Radio Show in London one of the first really portable TV sets was shown. The entire outer casing of this set is vacuum formed from nitrile sheet.

Called the Trans-Vista, this Ferguson battery / transistor receiver has a 7in. screen and weighs only 20lb. Working from a battery which can be recharged from the mains, the set gives four hours of continuous viewing and it is expected to have a retail price of about £100.

North British Rubber's Royalite was used for the casing, a grained texture being chosen for the body of the set to contrast with the folding cowl surrounding the screen.

FBRAM Golf Competition

SUCCESSFUL MEETING AT WENTWORTH

THE annual golf competition of the Federation of British Rubber and Allied Manufacturers was held at the Wentworth Club, Virginia Water, Surrey, on October 5. A record number of members turned out, in fact at one part of the morning the first tee looked rather like Waterloo Station on a Bank Holiday morning. The weather was fair to reasonable, being neither so good as last year and certainly as bad as has been known on this world-famous course. The competition was played to Stableford rules and some really excellent golf was enjoyed on what was undoubtedly a highly successful occasion.

The overall winner with the best net score was C. A. Ayling of the Dunlop Rubber Company, who took the challenge cup, the first prize in the sweep stake and also another prize from the impressive collection assembled. The second prize went to A. Thompson of Goodyear Tyre and Rubber Company and the third prize to L. V. Jennings of R. W. Greeff and Co. Ltd. The prize for the best gross score went to J. I. Cunneen, Natural Rubber Producers Research Association. Other prizes were won by A. H. Pendree (Goodyear), R. E. Holt (Dunlop), D. W. Langley (Dunlop), J. A. Forbes (Rubberware), L. B. MacQueen (Cabot Carbon), T. R. Mills (Kay Bros. Plastics), H. G. Hardman (Veedip), R. A. Storey (I.C.I.), A. W. F. Sanders (Rubber Regenerating), C. Woodward (Dunlop), G. W. J. Reinhardt (B. B. Chemical), T. W. W. Davie (North British), D. Davies (Davies Tyre), S. G. Deaves (BTR), B. J. Newey (Greengate and Irwell), D. Norman Thomas (Veedip), G. E. Barker (Pirelli), W. M. Frizell (Pirelli). Mystery prizes — the mystery lay not in the prizes themselves but in the grounds for the award— went to G. F. Carr (Dunlop), D. A. Bennett (ISR), D. D. Marshall (Greengate and Irwell) and A. R. Bullock (B. B. Chemical).

At the end of the day's play, prizes were presented by Mr C. H. M. Baker (Firestone Tyre and Rubber Co.), vice-president of the Federation.

In the evening, players were joined by some non-playing members of the Federation and more than 100 people sat down to dinner.

Some of those at Wentworth *(see facing page)*: **1. F. C. Wilks (BTR), D. A. Bennett (ISR), T. C. G. Thorpe (Esso); 2. A. Tonge (Mandleberg), L. B. MacQueen (Cabot Carbon), H. P. Goodall (Expanded Rubber); 3. F. I. Tuckwell and S. F. Smith (Dunlop); 4. C. A. Ayling (Dunlop), C. H. M. Baker (FBRAM Vice-President, Firestone); 5. P. W. Howard (BTR), S. C. Covell (Director FBRAM); 6. P. C. Masters (Manchester Oil), J. J. Gray (Manchester Oil); 7. M. Heywood (P. B. Cow), C. H. Mason (Avon), C. Woodward (Dunlop); 8. C. D. L. Smith (Wilfred Smith), R. McEwan (ISR); 9. J. Mattinson (Firestone), A. D. Wenzel (Firestone); 10. J. J. Gray (Manchester Oil), P. C. Masters (Manchester Oil); 11. A. W. F. Saunders (Rubber Regenerating), R. Bassett (BTR); 12. B. M. Fawkes (Rubberware), J. A. Forbes (Rubberware), D. E. Cameron (B.B. Chemical Co.), C. H. M. Baker (Firestone), A. R. Bullock (B.B. Chemical Co.), S. C. Covell (FBRAM); 13. A. Smales (Philblack), L. V. Jennings (R. W. Greeff; 14. D. Davies (Davies Tyres), D. Rankine (Dunlop); 15. J. A. Forbes (Rubberware), A. C. Struthers (Goodyear); 16. R. E. Berry (Telemac), Miss J. Wilson (FBRAM), T. Songhurst (Greengate & Irwell); 17. D. Norman Thomas (Lewis Gilder Veedip), J. E. Davies (Lewis Gilder Veedip)**

Receiving their prizes from C. H. M. Baker, vice-president of the Federation, are *(top pictures)*: **1. L. V. Jennings (Greeff); 2. J. I. Cuneen; 3. F. W. Langley; and 4. A. T. Thompson (Goodyear).** *Bottom pictures:* **5. R. T. Byford (RTA), T. W. W. Davie (North British); 6. J. P. S. Riddell, D. J. M. Wilson; 7. A. H. Pendree (Goodyear), R. Edwards (Akron Standard)**

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Mould Cleaning and Polishing

WITH the latest highly efficient fast cycling injection and compression moulding machines, time lost through cleaning and polishing the moulds is increasingly expensive in loss of production.

The old methods of cleaning, beside being time consuming, often use relatively violent abrasives which can and do cause severe damage to delicate moulds.

Although for many moulds where high dimensional accuracy is of secondary importance, loss of material from the mould will not adversely affect the finished product, for precision moulding this is not the case; abrasive cleaning treatment may mean that expensive moulds have to be discarded, because of dimensional inaccuracies long before this should have occurred.

A new machine has recently been developed by Abrasive Developments Ltd., Henley-in-Arden, Warwicks, which can be used to clean and polish all types of mould in a very short time without causing any damage. It is claimed that moulds cleaned by this method show no measurable weight loss and that after twenty cleaning and polishing processes, dimensional changes were less than .0001in.

The Vaqua Process, as it is called, is based on a high pressure jet of liquid consisting of an aqueous suspension of the media being directed on to the surfaces to be cleaned. In contrast to shot, sand or dry blasting methods, the use of water as a carrier eliminates impingement of the media on the mould surface.

This liquid, a mixture of water and Vaqua Shene media is projected at about 700mph at a pressure of 60psi and a flow rate of 240gpm for cleaning the mould and if required a lower pressure and flow of 60gpm is used for final polishing. The nozzle delivering the liquid is in a cabinet fitted with rubber gloves for the operator and a window so that the whole operation can be carried out under observation and with complete safety.

General view of the Vaqua processing unit showing controls and observation window

Much of the success of this process is due to the pump, fully patented and manufactured by Abrasive Developments Ltd. This is a tough, heavy duty, centrifugal, two-speed glandless unit and is lined with natural rubber.

Interior of the spray cabinet showing discharge nozzle

The smallest unit manufactured will treat moulds up to 2ft. square and other machines are available for use on larger moulds. The length of time needed to clean and polish a mould 1ft. square is under four minutes.

UK Agency for Duropal

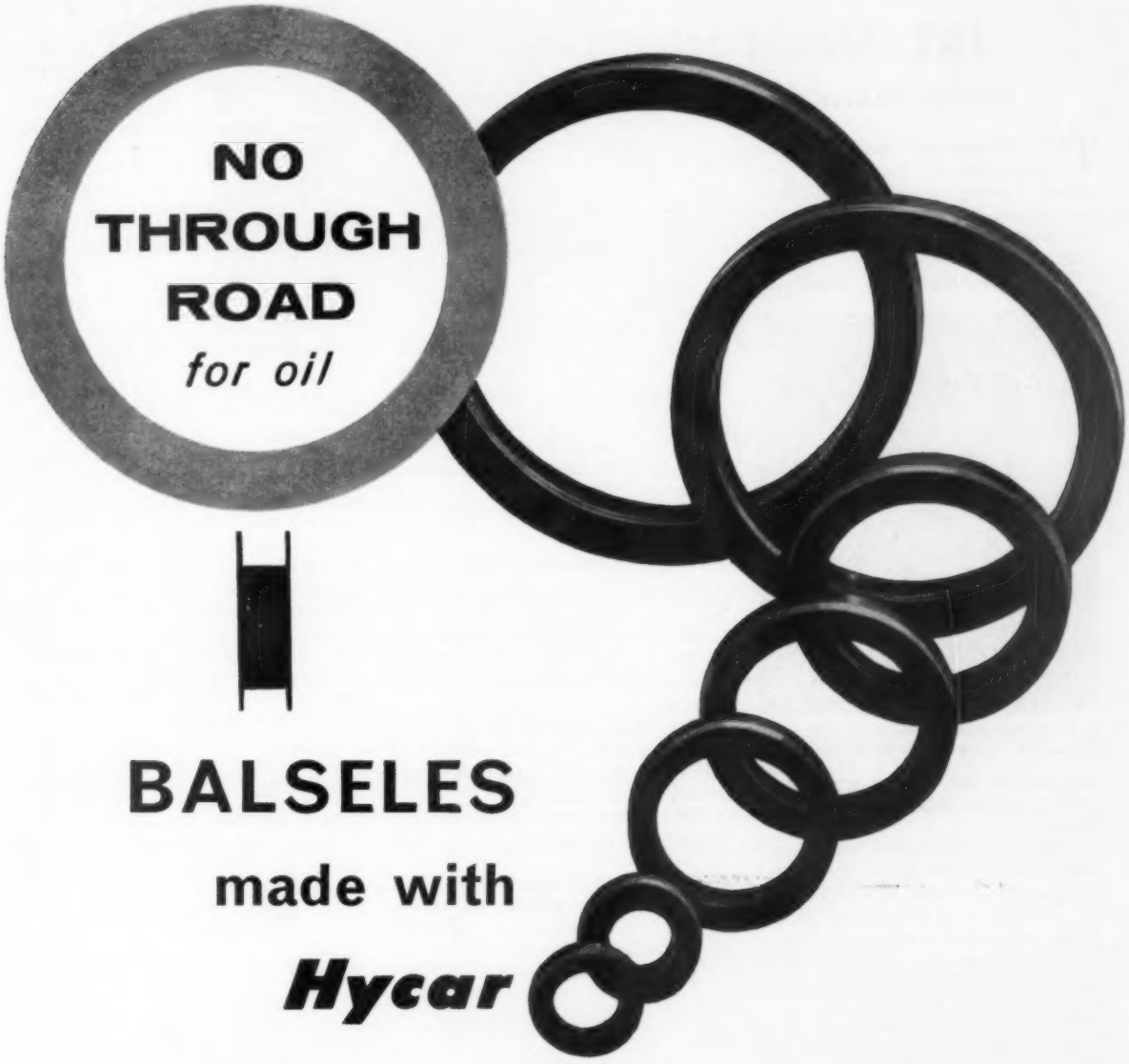
Pharaoh's Plywood Co. Ltd., Adelaide House, E.C.4, announce that they have been appointed sole agents in the UK and Ireland for the sale of 'Duropal' melamine-surfaced laminated plastic sheet, manufactured by Eberh. Wrede of Neheim-Hüsten/Ruhr, West Germany. The sheet is made in a standard thickness of 1.4mm. in 8ft. x 4ft. and 8ft. x 2ft. 7½in. in sizes, in a range of designs and colours and in three surface finishes — high gloss, satin (reduced reflection) and matt (non-reflective), all at the one price of 3s. 4d. per sq. ft. Duropal is also available in post-forming grade. The material is now being exhibited by Eberh. Wrede on Stand No. 250 in the Merwede Hall at the Utrecht International Plastics Exhibition.

IRI Leicester

The session started on September 29 with the now traditional meeting with the Burton-on-Trent Section at Ashby-de-la-Zouch. Mr D. M. Alstadt (manager of Central Research of the Lord Manufacturing Company and manager of the Hughson Chemical Company, a Division of the Lord Manufacturing Company, USA) giving a very interesting talk entitled 'Some Problems in Rubber to Metal Bonding.'

Mr Alstadt gave a summary of the fundamental aspects of this subject and showed how these could be applied to bonding problems. There was a large audience, well representative of both sections. Mr A. Blake, chairman of the Burton-on-Trent Section, proposed a vote of thanks to Mr Alstadt. Mr W. H. Swire, chairman of the Leicester Section, took the chair at the meeting.

The sale of Kuala Reman Rubber Estates' Nada Estate has now been completed. After allowing for payment of all costs there remains about £150,000. The directors propose to make a capital repayment of 1s. 6d. a share.



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IRI Manchester Golf

BRIDGE TROPHY AND AUTUMN COMPETITION

THE Manchester section of the Institution of the Rubber Industry Golfing Society held their competition for the Bridge Trophy last month at the Manchester Golf Club, Hopwood.

The conditions under which the competition was played were ideal, and the course was in excellent condition.

H. K. Mills receives the Bridge Trophy from Mr Forsyte (David Bridge Ltd.)

Thirty-five members took part, along with representatives from David Bridge and Co. Ltd. The winner was the ex-captain of the section, H. K. Mills, with a net score of 72, playing off a handicap of 6. Runner-up was the president, R. N. Ferguson, who had a net score of 74 off 9.

The prize-giving took place after a lunch provided by David Bridge and Co., and the cup was presented to Mr Mills by Mr Forsyte, a David Bridge representative. Prizes went to these scores:

H. K. Mills 78 — 6 — 72; R. N. Ferguson 83 — 9 — 74; S. K. Roberts 84 — 9 — 75; J. L. Ferguson 86 — 10 — 76; A. Lord 97 — 20 — 77; H. G. Redfern 89 — 12 — 77; L. R. Allanby — 84 — 6 — 78; T. R. Waring 90 — 12 — 78; B. Fitton 86 — 8 — 78; F. Savaage 92 — 12 — 80; E. Cheetham — 93 — 13 — 80; A. Tonge 91 — 10 — 81; A. Fleming 98 — 16 — 82; G. Y. Blomely 101 — 19 — 82; and R. Porter 126 — 24 — 102.

Prizes were awarded by David Bridge and Co., and by the following: T. Martin (Anchor), H. K. Mills (Rubber Regenerating), H. Brown (Hubron Rubber Chemicals), H. W. West (West and Senior), T. A. Wilson (British Recovered Rubber), F. M. Read (British Recovered Rubber), E. Cheetham (Whitehead Chemical), W. A. Ayres (British Titan), and G. Betts (Travis Industries).

Autumn Competition

The Autumn competition was held by the Manchester section on October 3, at the Royal Lytham and St. Anne's Golf Club. This was held in conjunction with the annual general meeting.

The competition was played under Stableford rules and, despite heavy rain in the morning, under ideal conditions in the afternoon.

The winner was Eric Cheetham, playing off a handicap of 13, with 35 points.

Thirty-two members took part and at a dinner in the evening the section captain — S. Heywood — thanked the house chairman and the staff of the Royal Lytham St. Anne's Golf Club. A. Whitehead was elected vice-captain to Mr S. Heywood, for the coming year.

Results of the competition:

E. Cheetham 35; M. Ferguson 34; T. R. Waring 33; S. T. Diggle 33; G. H. Robinson 32; L. R. Allanby 30; C. G. Follett 29; A. F. Sanders 29; F. Savaage 29; J. Halstead 29; E. Crewdson 27; C. T. Manson 27; and N. Grimshaw 13.

Prizes were donated by T. A. Wilson (British Recovered Rubber), A. N. Haworth (Ferguson, Shiers), S. Heywood (Alfred Smith), F. M. Read (British Recovered Rubber), G. H. Robinson (Henry Gardner), A. F. Sanders (Rubber Regenerating), T. R. Waring (I.C.I.), G. Betts (Travis Industries), C. G. Follett (Alfred Smith), C. T. Manson (Alfred Smith), and S. T. Diggle (Riley's Ltd.). G. C. S.

Scottish Section

The Institution of the Rubber Industry Scottish Section's East v. West match for the Cameron Cup and medal round for the V. Captains prize took place over the Dunblane Course recently. Although the course was heavy after rain, conditions overhead were good.

The medal round in the afternoon was won by the captain, Tom Davie, giving him the Scottish Challenge Cup for which he had tied earlier in the season at Glenbervie, and the McElroy medal and prize for the best aggregate over these two rounds. Waiving his claim to the V. Captains Prize, this went to D. F. Vallis with the third prize to T. B. Miller, both of North British Rubber and guests for the day. The second prize went to J. Picken. Results:

T. Davie	.. ..	75— 7 = 68
D. F. Vallis	.. ..	91—20 = 71
J. Picken	.. ..	96—24 = 72
T. B. Miller	.. ..	90—17 = 73
W. S. Alexander	..	81— 6 = 75

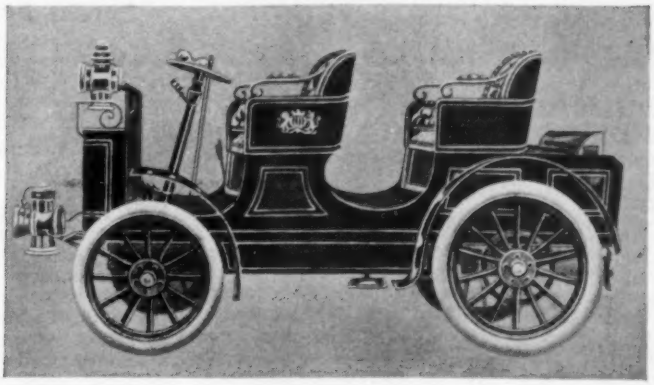
Prizes were donated by J. M. Gallie, S. McElroy, Mr Hardie, Mr McKechnie and J. Campbell.

EAST v. WEST MATCH
CAMERON CUP

P. Bell	.. ..	0 v. A. Bell ..	1
W. W. Somerville		½ v. S. McElroy ..	½
T. Davie	..	0 v. W. Alexander	1
T. Schofield	..	1 v. L. A. Johnson	0
A. J. Johnston	..	0 v. W. Johnston	1
D. McDonald	..	0 v. J. M. Gallie ..	1
N. Paulin	..	0 v. K. Manock ..	1
T. B. Miller	..	0 v. J. Campbell ..	1
D. F. Vallis	..	1 v. G. Wilson ..	0
J. Wilkie ..	..	1 v. A. Pratt ..	0
S. Jonkers	..	0 v. J. Picken ..	1
		3½	7½

J. M. G.

After the Bridge Trophy had been awarded at the Manchester Golf Club, Hopwood. This competition is usually played at Rochdale, and will probably return there next year



Motor car built for Edward VII by Gardner Serpollet Co. 1901.

Even in its own time this car was something of a curiosity.

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the following table shows the breakdown by class.*

CAR OWNERSHIP	Total	Social Class			
		AB	C	D	DE
Base of % — No. of Informants	2088	276	558	785	469
Percentage who had a motor car	34%	70%	43%	20%	17%

Today, it's television advertising that creates and consolidates markets:

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* These figures are quoted from the London Viewership Survey No. 3, commissioned by Associated-Rediffusion. Eric Laman (Telephone: HOLborn 7868) will be pleased to give you more details of your potential London market.

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Rubber Statistics

WORLD POSITION IN JULY

THE following advance information on the world rubber situation during July is given by the Secretariat of the International Rubber Study Group (in long tons):

NATURAL RUBBER

	July	Jan./July
Production ..	155,000	1,115,000
Deliveries from Stockpiles[1] ..	8,500	101,500
Consumption ..	155,000[2]	1,167,500[3]
		Change since Jan. 1, 1960
Stocks end period:		
In producing areas ..	265,000	+ 7,500
In consuming areas ..	225,000	+ 27,500
Afloat	180,000	— 50,000
	670,000	— 15,000

[1]Deliveries from the government stockpiles of the US and the UK. [2]Including estimated imports into the Soviet Union of 13,000 long tons and into China of 12,000 long tons. [3]Including estimated imports into the Soviet Union of 61,500 long tons and into China of 106,500 long tons.

SYNTHETIC RUBBER

	July	Jan./July
Production ..	155,000	1,125,000
Consumption ..	132,500	1,022,500
		Change since Jan. 1, 1960
Stocks end period	347,500	+ 37,500

Reported exports of rubber from Indonesia during July 1960 amounted to 42,018 long tons of which 17,545 long tons were reported as being of estate origin. Total reported exports during the period January/July 1960 amounted to 318,901 long tons.

Japan

The Japan Rubber Manufacturers' Association has announced that Japanese rubber articles production in July amounted to 18,061 tons, compared with 17,701 (revised) tons in June. A breakdown of the July output is as follows (with revised June figures for comparison):

	July	June
Motor car tyre/tubes ..	7,766	7,480
Bicycle tyre/tubes ..	856	882
Rubber-soled canvas shoes	1,005	1,006
Rubber shoes	1,493	1,464
Chemical shoes	523	475
Belts	946	901
Rubber coatings	614	624
Hoses	427	449
Industrial uses	2,223	2,232

The Japanese Rubber Importers' Association announced that Japan consumed 14,050 tons of crude rubber in August. Domestic consumption of crude rubber in September was estimated at 14,070 tons. The Japanese Custom House announced that Japan imported 13,500 tons of crude rubber in August, compared with 14,090 (revised) tons in July. September imports of crude rubber were estimated at 12,500 tons.

South Vietnam

South Vietnam exported a total of 73,433 tons of rubber last year, according to the Ministry of Agriculture. This compared with 1958 exports of 67,100 tons. The Ministry added that only 66,850 hectares of a total cultivated area of 100,440 hectares were exploited last year.

UK Rubber Stocks

Rubber figures at the end of September were as follows, in long tons: London: Landed, 2,052. Delivered, 5,231. Stock, 3,122. Liverpool: Landed, 4,600. Delivered, 9,860. Stock, 6,663. Respective totals 6,652, 15,091 and 9,785. Stocks included Board of Trade rubber.

PIGS v. IRIGS

THE DICK TROPHY

With the Plastics Industry Golfing Society as hosts, the second match for the Dick Trophy between the Scottish Section of the PIGS and the IRI Golfing Society was played over the Kilmacolm Course on September 15 under excellent conditions. The course, beautifully situated in the Renfrewshire Hills, was new ground to all but two or three in the party, and while there was complaints here and there about the quality of the golf, there was certainly none about the scenery.

D. Chesney	½	W. Alexander	½
P. Bell	1	W. W. Somerville	0
A. Bell	1	J. Tennant	0
J. Davidson	0	L. A. Johnson	1
J. Morton	0	W. Boyd	1
J. Scott	1	D. Beeze	0
J. Dodds	1	A. Pratt	0
W. McMurray	½	J. M. Gallie	½
D. Milligan	0	G. Wilson	1
K. Manock	0	C. Cook	1
S. Rosie	1	J. Picken	0
	5		4

The IRIGS, with an aggregate of 13 matches to 6, with two halved, won the Dick Trophy for the second time.

J. M. G.

PRP Director

Mr G. R. T. Langford-Allen has been appointed managing director of Palmers Reinforced Plastics Ltd., Saville Works, Croydon Road, Beckenham, Kent, a member of the Thomas Tilling Group. Mr Langford-Allen, who lives at Knoll Road, Bexley, joined PRP from Bakelite Ltd. in February 1960.

Patent Specifications

The following information is prepared from published Patent Specifications by permission of the Controller of H.M. Stationery Office. The full Specifications can be obtained from the Patent Office, 25 Southampton Buildings, W.C.2, at 3s. 6d. per copy (including postage).

Polyurethane Thread

No. 847,673. United States Rubber Co. Application and Filed, September 27 1957. Application in USA, November 15 1956. Published, September 14 1960.

An elastomeric thread is made by forcing a liquid polyurethane prepolymer through a fine nozzle and setting the prepolymer, as it emerges from the nozzle, by treatment with a primary aliphatic diamine such as ethylene diamine. The thread is subsequently cured by immersion in hot water. The polyurethane prepolymer may be of the polyester or the polyether type, or a mixture or combination of the two types.

Typical values for the tensile strength and elongation at break of the elastomeric polyurethane thread are 9,000 psi and 700% respectively. The thread may be used for any of the purposes to which ordinary rubber thread is put and is much superior to ordinary rubber thread in many respects. The superior properties include considerably higher resistance to tear and abrasion as well as relative immunity to the deteriorating effects of light, ozone, heat, chlorine and dry-cleaning agents. Ordinary rubber thread cannot be knitted as it wears very easily whereas the polyurethane thread can be knitted and otherwise handled in a manner that has not been possible with other elastomeric threads.

Curable Polythene Compositions

No. 847,816. General Electric Co. Application and Filed, December 7 1956. Application in USA, December 22 1955. Published, September 14 1960.

An organic or inorganic base is incorporated in a silica-filled polythene composition containing di-alpha-cumyl peroxide as the curing agent. Guanidines are the preferred basic materials, diphenylguanidine and di-ortho-tolylguanidine being used in examples. Other suitable basic materials include basic lead carbonate, dibasic lead phosphate and basic lead silicate. The advantage of the addition of the basic material is that it renders the cumyl peroxide less sensitive to decomposition on milling of the polythene composition.

Shorter Abstracts

Thermoplastic Resins. 845,099. Union Carbide Corporation. Filed, May 19 1959.—Polythene with improved flame resistance, incorporating hydrocarbon rubber and a flame resistant compound.

Diisocyanates. 845,446. Imperial Chemicals Industries Ltd. Filed, May 9 1958.—Method of manufacture of low volatility diisocyanates such as diisocyanato dibenzfurans.

Rubber and Plastics Stock Market

A REVIEW OF PRICES AND TRENDS

THE time has come, the Walrus said. . . . And indeed it has as far as stock market affairs are concerned. For it now looks as though from an investment point of view equity shares have come to the cross-roads of new decisions. Recent reports indicate that the credit squeeze is now really having serious effects on more than one of our major industries. Other economic yardsticks such as the balance of payments position, exports and the like still make for gloomy reading. Yet the Government until now have not shown any indication of introducing the ready measures which would produce the odd shaft of sunshine or so. On a day-to-day basis business has for the best part been on a modest scale. Selling has been light. Most folk still take the view that if there is to be a setback it will be on a minor scale. Nowhere near the 10% fall needed to make it a paying proposition to take profits now and buy in again. Nevertheless uncertainty rules the roost and there seems little to suggest otherwise that the market has entered somewhat unsettled times.

Meantime most of the features that have appeared over the past week or so have in most cases been due to the continued flow of good news from the boardrooms. Take a glance at our price list below. Outstanding there is the shares of the GEORGE ANGUS firm with a gain of 7s. 3d. This move was connected with the news that the interim dividend is to go up from 5% to 7½%. The directors also reported that trading results for the first eight months of the year show a further improvement which can be attributed to a greater volume of sales at home and abroad. They said that in the absence of any unexpected adverse circumstances they hoped to recommend a final payment of 12½% against last year's 10%.

In contrast the 10s. shares of the DUNLOP RUBBER group have tumbled 4s. to 24s. 6d. Reason here was the chairman's warning in his half-time report to shareholders that for the rest of the year business will be affected by the reduced activity in the motor industry in the UK and elsewhere. Profits, he stated, for July-December are unlikely to reach those of the second half of 1959. On present estimates, however, they should be about the level achieved during January/June 1960. Another big disappointment was the same again dividend of 4d. a share. Net profits worked out at £3.29m. compared with £3.15m. for the corresponding half-year and with the 1959 total of £7.17m. Sales over

Continued on page 711

Share Price Movements

Par Value	Company	1960 High	Low	Oct. 8	Latest
£1	A.E. Ind. Ord.	67/–	45/3	45/3	43/–
5/-	Albright & W. Ord.	31/9	25/9	28/–	28/6
£1	„ „ „ 5% Pref.	17/3	15/6	15/3	15/3
5/-	Anchor Chemical Ord.	18/7½	14/9	16/–	15/7½
5/-	Andersons Rub. Ord.	—	—	3/9	3/9
£1	Angus Geo. Ord.	60/6	34/9	53/–	60/3
5/-	Ault & Wiborg Ord.	25/3	20/–	23/3	25/–
£1	Avon India Rubber Ord.	46/6	35/–	35/–	35/6
£1	„ „ „ 6% Pref.	20/–	17/6	18/9	—
10/-	Bakelite Ord.	62/6	39/9	59/9	57/3
£1	„ 6% Pref.	19/3	16/9	19/–	19/–
£1	Baker Perkins Ord.	45/6	40/–	45/6	46/3
4/-	Bank Bdg. Rubber Ord.	4/3	2/3	3/–	2/6
4/-	Brammer H. Ord.	18/6	16/9	18/3	18/9
10/-	Bridge, David Ord.	66/6	53/6	65/6	65/6
5/-	Bright, John Ord.	18/6	15/3	16/9	17/–
5/-	Brit. Blting. & Asb. Ord.	—	—	19/6	19/6
£1	„ „ „ Pref.	—	—	17/3	17/3
2/-	Brit. Ind. Plas. Ord.	12/1½	5/3	10/1½	9/10½
2/-	„ 10% (tax free) Pref.	4/9	4/3	4/9	4/9
£1	British Xylonite Ord.	113/–	78/9	111/–	114/6
£1	„ „ 5% Pref.	18/9	14/–	14/6	14/6
£1	BICC Ord.	61/3	49/9	51/9	51/3
5/-	BTR Ind. Ord.	17/3	9/9	16/1½	16/6
£1	„ „ 7½% Pref.	24/3	23/–	21/3	21/3
5/-	Cole, E. K.	31/9	18/10½	—	29/–
£1	Courtaulds Ord.	59/4½	44/3xc	54/9	56/10½
£1	„ 5% 1st Pref.	17/9	16/3	15/9	15/9
£1	„ 6% 2nd Pref.	21/–	19/–	18/6	18/6
4/-	Cow, P. B. Ord.	9/6	6/9	8/9	9/–
£1	„ „ 5% Pref.	15/6	14/–	14/–	14/–
1/-	Dannimac Mfg. Ord.	12/9	9/–	11/3	12/10½
10/-	De La Rue Ord.	91/–	65/6	72/3	67/6
£1	„ „ „ 3½% Pref.	12/–	10/–	10/3	10/3
10/-	Distillers Co. Ord.	45/7½	32/9	42/3	43/7½
£1	„ „ 6% Pref.	22/–	19/6	19/6	20/–
£100	„ 5% Conv. Loan	£96	£95	£95	£95
£100	„ 5½% Unsec. Loan	£97	£87½	£86½	£86½
10/-	Dunlop Rubber Ord.	30/6	21/9	28/6	24/6
£1	„ „ 5½% Pref.	19/–	16/6	16/3	16/6
£100	„ 3½% 1st Debs.	£78	£68	£69	£69
£100	„ 4½% 2nd Debs.	£87	£80	£79	£79
£1	Eng. Elect. Ord.	53/6	—	35/3	32/6
4/-	Ebonite Cont. Ord.	14/3	11/–	11/3	11/–
£1	English China Clays Ord.	95/–	74/6	86/–	87/6
£1	Goodyear Tyre 4% Pref.	12/9	10/9	11/6	11/6
5/-	Greeff Chem. Ord.	35/–	23/6	25/–	25/–

Par Value	Company	1960 High	Low	Oct. 8	Latest
10/-	Greeff Chem. 5½% Pref.	9/–	8/6	9/–	8/–
5/-	Hackbridge Hldg.	17/6	14/3	15/4½	15/4½
4/-	Greengate & Irwell Ord.	6/6	5/3	6/3	6/3
£1	Harrisons & Crosfield Dd.	64/–	49/6	53/9	53/9
1/-	Hunt & Moscrop Ord.	2/9	1/9	1/10½	1/7½
£1	Imp. Chem. Ord.	75/3	56/6	71/3	70/9
£1	„ „ 5% Pref.	18/–	16/3	16/3	16/3
£100	„ 4½% Unsec. Loan	£89½	£81	£82½	£82½
£100	„ 5½% Conv. Loan	£212½	£90xc	£92½	£92½
1/-	Kleemann (O. & M.) Ord.	11/6	8/3	9/4½	10/1½
£1	„ „ 6½% Pref.	19/–	17/–	17/6	17/6
5/-	Laporte Ind. Ord.	33/6	25/3	31/3	31/9
£1	„ „ 7½% Pref.	24/3	23/3	23/3	23/3
£1	Leyland & Birm. Rubber Ord.	63/–	46/3	53/6xd	52/6
£1	„ „ „ 6% Pref.	19/–	17/6	18/9	18/9
2/-	London Rubber	14/9	11/–	13/–	13/3
£1	„ 6% Red. Cum. Pref.	20/–	18/9	18/9	18/9
£1	McKechnie Bros. Ord.	71/6	57/–	60/–	60/–
£1	„ „ 'A' Ord.	69/3	56/–	61/3	61/3
£1	„ „ 6% Cum. Pref.	18 –	16 –	17/–	17/–
5/-	Monsanto Chem. Ord.	28/–	23/3	28/6	30/9
£1	„ „ 3½% Pref.	12/9	12/–	12/6	12/6
£100	„ „ 6% Debs.	£103½	£98	£98	£98
5/-	Miles (H.G.) Holdgs. Ord.	11/3	9/9	10/–	10/–
£1	North British Rubber	21/3	16/–	16/–	16/3
5/-	Northwestern Rubber	—	—	13/1½	12/–
5/-	Plastic Enginrs. Ord.	30/–	20/–	29/6	29/–
5/-	Redfern Holdings Ord.	5/9	4/–	4/–	4/–
2/-	RFD Ltd. Ord.	6/6	4/–	4/–	4/–
£1	„ „ 5½% Pref.	14/6	12/9	13/9	13/9
2/-	Rubber Imp. Ord.	7/9	4/–	4/6	4/–
2/-	„ „ 'A' Ord.	7/–	3/3	3/6	3/6
£1	„ „ 5% 1st Pref.	15/–	11/3	11/10½	11/10½
5/-	Rubber Reg. Ord.	19/3	17/–	18/–	18/6
4/-	Shaw Francis Ord.	27/6	21/3	22/6	21/6
2/-	Silentbloc Ord.	13/3	10/–	8/9xr	9/–
5/-	Storey Bros.	41/3	28/3	40/–	39/–
2/-	Sussex Rubber Ord.	2/3	1/3	2/–	2/–
5/-	Sutcliffe Speak Ord.	15/9	11/–	13/6	13/6
£1	Turner & Newall Ord.	60/10½	48/3	57/4½	57/4½
£1	„ „ „ 7% Pref.	25/–	22/3	22/9	22/9
5/-	Universal Asbestos Ord.	50/–	25/–	25/–	24/3
5/-	Viscose Dev. Ord.	16/6	14/9	16/–	16/–
5/-	Warne W. (Holdgs.) Ord.	18/9	15/3xc	17/6	17/9

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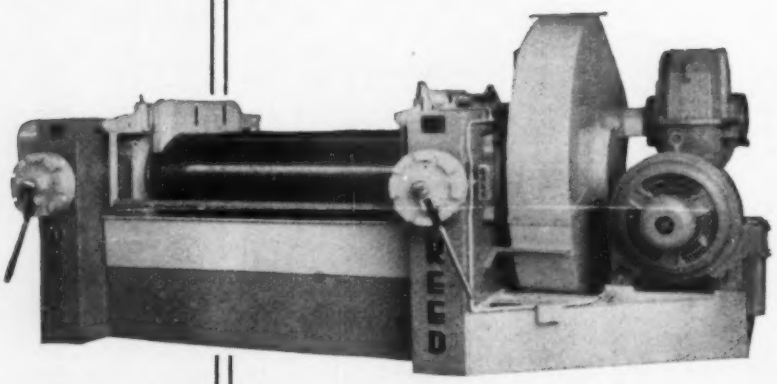

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Rubber Markets

LONDON

A further decline in Eastern prices brought values down sympathetically. Business was of a patchy nature, with factories showing only occasional interest, while landed market activity included a fairly large volume of switching deals in addition to short covering. Despite the lower levels, there was little evidence of selling pressure. The London Dock tally clerks' dispute kept 'spot' rubber at a premium and some time was expected to pass before technical difficulties could be straightened out.

Latest prices are as follows:

No. 1 RSS Spot: 28¼d. nominal.

Settlement House:

November 27⅞d.-28¼d.

December 27¾d.-28d.

January/March 27½d.-27¾d.

April/June 27¼d.-27½d.

July/September 27d.-27¼d.

October/December unquoted.

No. 1 RSS cif basis ports:

November 27¾d.-28d.

December 27¾d.-28d.

Godown:

November unquoted.

LATEX

Centrifuged 60% latex per gallon in drums, seller, October, November, December, 15s. 10d., cif European ports. Spot, seller, 16s. 6d. Bulk, d.w. 15s. 5d. nominal. Creamed, seller, not quoted, October, November. Normal, seller, October, November, 13s. 6d.

BANGKOK

No. 1 RSS

The price of No. 1 RSS at Bangkok on October 17 was 30.87½ (31.12½) US cents per lb.

DJAKARTA

Very quiet conditions prevailed on the market on October 17. Buyers' interest was lacking. The market closed quiet.

	Rupiahs per kilo	
	Oct. 17	Previous
Spot No. 1 Priok ..	31.75n	32.00n
Spot No. 2 Priok ..	30.75n	31.00n
Spot No. 3 Priok ..	27.75n	28.00n
No. 1 fine pale crepe, spot	32.25n	32.50n

Tone: Very quiet.

CEYLON

No. 1 RSS

The price of No. 1 RSS at Colombo on October 17 was 102½ Ceylon cents per lb.

SINGAPORE

The market opened uncertain and lower on October 17. Buyers were very reluctant. Business developed very slowly and was confined to some shortcovering. Demand for lower sheet was small and selective. Factories showed no interest. Very quiet conditions prevailed in the afternoon. Prices remained virutally unchanged throughout. Lower sheets were in small demand.

	Malayan cents per lb., fob Malayan ports to open ports	
	Oct 17	Prev. Close
No. 1 RSS, Nov. ..	93⅞–94¼	95¼– 95½
Dec. ..	94¼–94½	95½– 95⅞
No. 2 RSS, Nov. ..	92½–93¼	93¼– 94½
No. 3 RSS, Nov. ..	91⅝–92½	92½– 93⅜
No. 4 RSS, Nov. ..	89 –90	91¼– 92¼
No. 5 RSS, Nov. ..	83½–84½	85 – 86
No. 1 RSS, Spot ..	93½–93¾	94¾– 94⅞
No. 3 blanket thick remilled crepe, Nov.	79 –80	80 – 81
No. 1 fine pale crepe, Nov.	97 –98½	99 –100
2x thin brown crepe, Nov.	76½–77½	77½– 78½

Tone: Quiet.

The Industries Syndicate quote latex, native produce, 60% centrifugal, packed in rectangular drums, fob at 182.00d. per gallon.

NEW YORK

The New York rubber market ruled as under on October 17:

DEALERS' PRICES

	US cents per lb. ex-dock	
	Oct. 17	Previous
No. 1 RSS, Nov. ..	33⅞a	33⅞a
Dec. ..	32½t	—
No. 2 RSS, Nov. ..	33⅛a	33⅜a
Dec. ..	32⅜a	—
No. 3 RSS, Nov. ..	33⅛a	33⅛a
Dec. ..	32⅛a	—
No. 1 RSS, Spot ..	34n	34⅛n
No. 3 amber blanket crepe, Jan.	27½n	—

FUTURES—REX CONTRACT

	Oct. 17	Prev. Close
Nov. ..	33.55b–33.60a	34.00t
Jan. ..	32.25b–32.40a	32.60b–32.70a
March ..	31.90t	32.15t
May ..	31.60b–31.65a	31.90b–31.95a
July ..	31.20b–31.45a	31.65b–31.80a
Sept. ..	31.10b–31.20a	31.55b–31.70a
Nov. ..	30.90b–31.10a	31.10b–31.25a

Sales: 52. Tone: Easy.

Futures were easier on October 17 reflecting the decline in Singapore and scattered selling here. Trading was moderate. Physical rubber was quiet and softer. In late dealings futures continued easy.

AMSTERDAM

The Amsterdam rubber market ruled as under on October 17:

	Guilders per kilo	
No. 1 RMA	Oct. 17	Previous
October	2.73	2.75
November	2.72	2.74
December	2.71	2.73
Oct./Dec.	2.72	2.74
January	2.68	2.70
February	2.67	2.69

Sales: Nil. Tendency: Quiet.

STOCK MARKET

Continued from page 709

the same period rose by £9m. to £136m.

Money, money, money. That is what the large companies are wanting all the time. One of the latest to announce plans for raising fresh capital has been BRITISH XYLONITE. They have decided on the popular method of a 'rights' issue. Terms will be one-for-one basis at par. Very attractive indeed for at the current level of 114s. 6d. the rights are worth around the 47s. mark. The new shares will not rank for the unchanged 4% interim also declared. Board hopes to be able to pay a final of 11% on the bigger capital which would represent the equivalent rate of 13% per annum on the enlarged capital. These new funds will go towards the cost of the group's expansion programme which involves increasing expenditure on plant and research essential in the plastics industry. More working capital is also likely to be required to finance rising production.

Holders of over 77% of the ordinary capital of the LACRINOID PRODUCTS business accepted the offer made by F. FRANCIS AND SONS (HOLDINGS) which has now become unconditional. In this event the quotation in our list now disappears.

FRS SR Prices

Firestone's latest prices for synthetic rubbers are as follows (delivered UK factories; pence per lb., excluding import duty):

Hot Rubber Types: FRS 1000, 1001, 1004, 1006, 1007, 195; 22.50. Cold Rubber Types: FRS 1500, 1502, 146; 22.50. Oil Modified Types: FRS 1703, 173; 19.11. 1710, 1712, 184; 18.00. FRS 178; 18.25. FRS 201; 16.71. Specialty Types (prices from September 1: FRS 1009, 23.06. 1012, 22.59. 1013, 23.29. 1014, 26.18. 181, 22.50. 182, 23.29. 147, 20.94. 158, 28.00. 158-S, 27.50. UK agents are Henry Gardner and Co. Ltd.

Dunlop Australia

Sales of Dunlop Rubber Australia for the year ended June 30 reached a record £A63m. (£A57m. previous). Group profit fell from £A1.79m. to £A1.66m. after taxation of £A1.17m. against £A1.22m. The directors state that the figures were adversely affected by higher raw material costs, wage increases and competition.

Company in the News

Greengate and Irwell

Announcing maintenance of the interim dividend at 5% on account of the year ending March 31 1961, the directors of Greengate and Irwell Rubber Co. informed holders that conditions throughout the industry remained highly competitive but improvements in the company's results, due to reorganizations made, have continued.

LINDSAY AND WILLIAMS LIMITED

Announcement

PLASTIC MOULDINGS AND GLASS FIBRE FABRICATION ARE NOW IN PRODUCTION AT MANCHESTER AND BELFAST FACTORIES

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PG 101

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SAMPLES AND QUOTATIONS FROM THE SOLE DISTRIBUTORS TO THE RUBBER INDUSTRY

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Industry INTELLIGENCE

Technical Data

Geigy Polyester

Technical Data sheet No. 20 issued by The Geigy Co. Ltd., Plastics Chemicals Division, Rhodes, Middleton, Manchester, gives details of development polyester 430.

This is used as a plasticizer for PVC compounds for applications where good resistance to petrol, oils, and fats is essential but where resistance to aqueous extractants is less important. The viscosity of the material is lower than that of some unmodified polysebacates and polyadipates and it is therefore easier to process.

PVC compounds made with this polyester fall into the same class of hardness and low temperature flexibility as those made with Reoplex 100. The volatility loss is negligible and satisfactory behaviour in compounds kept at elevated temperatures can be predicted.

Factice in Nitrile

Anchor Bulletin 155/R/60 issued by Anchor Chemical Co. Ltd., Manchester 11, describes the behaviour of two Anchor grades of factice in nitrile compounds. These are oil-resisting factice 854 and third grade dark factice 820.

The bulletin refers to an article published in *RJIP* 1960, 138, 235, demonstrating the beneficial effects of factice on the ease of processing and performance of nitrile rubber compounds. The experimental work described shows the effect of the two grades of factice in several compounds and the conclusions drawn are that factice is a useful and economic process aid which may be used in partial replacement of ester plasticizers or in addition to plasticizers already present.

Polysar SBR

Polysar S-X 370 is a cross-linked, non-staining and non-discolouring SBR. It can be used as a processing aid, in amounts up to 25% of the rubber hydrocarbon content in other butadiene-styrene rubbers, in butadiene-acrylonitrile and natural rubbers, with only minor changes to the physical properties of the vulcanizate. S-X 370 is identical with S-X 371 except that it has a higher ash content and is therefore recommended for soling, calendering and extruded goods, and for other applications not requiring the use of low ash elastomers.

Polysar Krylene 602 is the most recently developed Polysar general purpose rubber, is a non-staining, cold, butadiene-styrene copolymer with excellent processing properties. A compound suitable for moulded-on sponge soling is described in a recently issued technical report which gives experimental procedure and physical properties of the compound.

Further information on these two products is available from Polymer (UK) Ltd., Walbrook House, Walbrook, London, E.C.4.

Machines, Materials and Equipment

Portable Gas Flowmeter

A portable gas flowmeter which the Cobb-Slater Instrument Co. Ltd., Cosim Works, Darley Dale, Matlock, Derbyshire, has been producing in a specialized form for aircraft for several years, is now being offered for wider industrial use.

The gas flow is arranged to cool an electrically heated element; the rate of flow determines the temperature of the element, and the electrical circuit indicates this temperature on a pointer instrument directly calibrated to show the flow rate. A socket is provided for taking out control signals, or for feeding a remote indicator.

The instrument has a response time of the order of one second and will measure flows down to 1 cc per minute. It will handle any non-corrosive gas, and can be used for indirect flow measurement of corrosive or dirty liquids. In the latter case, arrangements would be made to measure air flow into or out of the liquid reservoir.

'Push-on' gas connectors facilitate the incorporation of the meter into laboratory set-ups.

Face Shield

A newly-designed face shield consists of a headband and brow guard with detachable flip-up vizor. The headband is made from light weight fibre, and has a sweat band of comfortable and easily replaceable self-adhesive polyurethane. The brow guard is made of Celastoid, providing ample spark and splash deflection, available in six different colours. The detachable vizors are made from clear non-flammable Celastoid with rigid aluminium edge. Prices from 16s. each and further particulars from Safety Products Ltd., Holmethorpe Avenue, Redhill, Surrey.

New Balance

In a new balance developed by Griffin and George Ltd., Ealing Road, Alperton, Wembley, Middlesex, the agate bearings are all relieved when the beam is lowered instead of only the central bearing. The arrestment is provided with integrally pressed Y-arms to support the single piece, pressed metal stirrups clear of the end knives when the beam is held at rest. The agate knives are retained by the new method of positioning screws. The metal rider-bar carries two captive riders of 1.0g. and 0.1g. respectively. They move over nine notched divisions from left-hand zero to centre and over 50 divisions from centre zero to the right. This 'Duorider' system increases the speed of operation since it eliminates the use of fractions of a gramme. Capacity is 250g., the pointer is white against black engraved scale, the beam is of solid-type, 8in. long, brass, the sensitivity is to 2mg. Price in the UK: £8 17s. 6d.

Publications

Styrene Monomer

Technical Service bulletin 1U/1 'Styrene Monomer' published by Monsanto Chemicals Ltd., details the physical and chemical properties and specification of the styrene monomer produced at Grangemouth by Forth Chemicals Ltd., and sold by Monsanto. There is no more than an outline of the many applications of styrene monomer but some publications are referred to in a bibliography.

Storage and handling, health hazards and fire and explosion hazards are briefly discussed.

Rubberized Road Bulletin

A feature of Birmingham's new road development schemes is the widespread use of rubberized bitumen on difficult and heavily trafficked surfaces. Roads Bulletin No. 14, just issued by the Natural Rubber Bureau, illustrates the growth of these new developments in England's second city over the past ten years.

Once the quality of bitumen mixed with natural rubber had been established by trials begun in 1951, other layings followed on some of the city's busiest streets and, early this year, Smallbrook Highway, showpiece of Birmingham's rebuilt city centre, was resurfaced with rubberized asphalt in both the base and wearing courses.

Other roads illustrated in the Bulletin which have been given a rubberized surface since 1957 include: Liverpool Street, where buses turning out of a central depot subject the road to heavy stresses; Wellington Road, Handsworth, a section of the outer ring road much used by big transports; Soho Hill and Stratford Road, both very heavily trafficked areas; bus stops and traffic islands.

Copies of these bulletins are available from the Natural Rubber Bureau, Market Buildings, Mark Lane, London, E.C.3.

Two New Films

Imaginative photography, excellent colour and a well-told story characterize two new films issued last week.

'Made for Travel,' issued by Dunlop, unfolds the 'secret' life of a Dunlop tyre; its birth, testing and subsequent ability to withstand harsh treatment by a world of uncaring motorists who take its strength for granted.

Produced by British Associated Pathé Ltd., with the object of showing the ordinary motorist just how much thought and work goes into the making of a tyre, the film is made in three parts. It opens with an amusing and ingeniously made tyre's eye view of life — the upright view of a well-cared-for tyre and the distorted view of the neglected tyre.

To a swiftly moving orchestral score, the film then shows the manufacturing sequences in detail. This is followed by a sequence showing the punishing tests a tyre undergoes in the test house and on Dunlop test track.

The film is in Eastman Colour and runs for 20 minutes, 16mm. sound prints are available on loan from the Dunlop Film Library, Wilton Crescent, Merton Park, London, S.W.19.

'Formula and Form' made by Chemische Werke Hüls with a commentary in English, portrays extremely well the exacting and comprehensive testing programme carried out before the plastics products reach the market.

The film will be especially valuable in helping to increase the familiarity of the layman — for it is not technical — with names so well known in the industry, polythene, polystyrene, PVC, polypropylene. It is effectively shown that plastics are not universal materials, they have their limitations, but if properly chosen they do their job well in every way. The film stresses the tremendous amount of research, testing and development carried out in the CWH laboratories and testing stations. There are striking shots also of different processes: injection moulding, extrusion, vacuum forming. This colourful and well made film will certainly achieve its aim of enhancing confidence in plastics materials.

The film is available on free loan from the London representative of Chemische Werke Hüls, Herbert G. F. Greenham, 41, Dover Street, London, W.1.

Mr David W. H. Galbraith has been appointed director of marketing of Chemstrand.

British Standards

Methods of Testing Vulcanized Rubber

BS 903: Part A17: 1960. Determination of the permeability of rubber to gases, published under the authority of the Rubber Industry Standards Committee, is a further step in the lengthy revision of the 1950 edition of BS 903.

The new part A 17 replaces part 29 of the 1950 edition. The methods contained in the old edition were more particularly applicable to proofed fabrics and have therefore been replaced by a method which is specifically applicable to rubber in the form of thin sheeting, inner tubes, and so on.

The new publication gives full details of the test piece, apparatus required and procedure, as well as the method of expressing the results of the test.

Rubber Closures for Injectable Products

BS 3263:1960 for vulcanized rubber closures for injectable products lays down tests and requirements which ensure that the closures form, with their appropriate seals, an effective barrier against micro-organisms after sterilization.

To produce suitable closures, various fillers, accelerators and antioxidants are mixed with the rubber before vulcanization. As a result, the miscellaneous closures will possess different properties and this standard provides methods and limits with which closures intended for use with injectable products must comply.

However, it has been found impracticable to devise a set of standards which, if complied with, would ensure the compatibility of the rubber closures with pharmaceutical products with which they are used. Instead, a test for compatibility must be carried out before a rubber mix is approved and an appendix is included to provide a suggested standardized procedure for such a test. It follows that any proposed change in the composition of an approved rubber mix must be notified to the user, since further compatibility tests may be necessary.

An appendix is also included covering the determination of permeability to water vapour and the standard itself provides limits for workmanship and finish, tolerances, penetrability, fragmentation, self-sealability, water extract and alkalinity or acidity, together with detailed methods of test.

The address of the British Standards Institution Sales Branch is 2 Park Street, London, W.1

The Board of Trade is considering fixing anti-dumping duties on vinyl acetate monomer imported from Italy and Switzerland. Representations can be accepted up to October 28.

NEW COMPANIES

J. E. Irvine and Co. Ltd. (671,412).—September 30. Capital: £1,500 in £1 shares. To carry on the business of manufacturers of and dealers in mechanical plant and machinery and plastics and metals, and articles made therefrom, etc. The permanent directors are: John E. Irvine and Jutta Irvine, both of The Oaks, Blackwater, Camberley, Surrey. Regd. office: 30 Cursitor Street, E.C.4.

L. Hill (Plastics) Ltd. (671,650).—October 3. Capital: £10,000 in £1 shares. The directors are: Lewis Hill, Linton Cottage, Holders Hill Crescent, N.W.4; Irene M. Catcherets, 47 Forset Court, Marble Arch, W.2; James M. Reid, 143 Fellows Road, N.W.3. Regd. office: 17/19 Great Eastern Street, E.C.2.

Underflow Heat Ltd. (671,670)—October 3. Capital: £100 in £1 shares. To carry on the business of manufacturers of and dealers in plastic materials, etc. The directors are: Mrs Kathleen W. Robinson, 93 Castleton Avenue, Wembley, Middx.; Mrs Patricia E. J. McBurney, 13 Mulgrave Road, Harrow, Middx. Regd. office: 93 Castleton Avenue, Wembley, Middx.

D. F. Adamson Ltd. (671,698)—October 4. Capital: £100 in £1 shares. To carry on the business of processing and manufacturing of articles produced from natural and synthetic rubber, and plastic for domestic, office, industrial and trade use, etc. The subscribers (each with one share) are: Douglas F. Adamson, 13 Aldershot Road, Fleet, Hants (company director); David F. P. Sharrock, 64 Leyfield, Worcester Park, Surrey (barrister). The first directors are not named. Solicitors: Taylor, Jelf and Co., 12 Norfolk Street, W.C.2.

Models (London) Ltd. (671,795).—October 5. Capital: £5,000 in £1 shares. To acquire the business of display model manufacturers carried on by Joseph H. Togneri and Edmund V. C. Togneri, at 22 Brownlow Mews, W.C.1, and carry on the business of manufacturers, workers, welders and fabricators of and dealers in plastic materials and synthetic products, etc. The first directors are: Joseph H. Togneri, 464 Hornsey Road, N.19; Edmund V. C. Togneri, 229 Algernon Road, S.E.13. Regd. office: 22 Brownlow Mews, Guildford Street, W.C.1.

K.P. Plastics (Bletchley) Ltd. (671,866).—October 6. Capital: £200 in £1 shares. To carry on the business of manufacturers, prefabricators, producers, exporters and importers of and dealers in plastic mouldings, fairings and plastic products, polyester resins, etc. The first directors are: Henry C. Peacock, 42 Kenilworth Drive,

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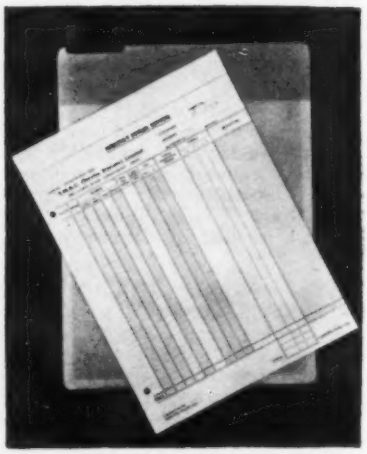

A new system for petrol accounts has been developed by Tintera Press, which enables accounts to be accurately and quickly recorded. The specially printed record papers are kept in protective wallets made from Iridon's high-impact polystyrene sheeting. Two sheets of H.I.P.S. are joined together by adhesive; the base sheet is in opaque blue (40 thou.) and the top sheet is a 20-thou. translucent white

Bletchley; Eric F. Kidd, 108 Water Eaton Road, Bletchley. Regd. office: 147 Bletchley Road, Bletchley, Bucks.

Polyglaze Ltd. (671,876).—October 6. Capital: £100 in £1 shares. To carry on the business of manufacturers and repairers of and wholesale and retail dealers in plastics and synthetic substances and compositions, etc. The directors are: Francisco Burdeus, 18 Prothero Gardens, Hendon, N.W.4; Manuel Candelas, 57 Cheyne Walk, Hendon, N.W.4; John S. Quartley, 38 Fairfield Avenue, Horley, Surrey. Regd. office: 47 Long Acre, W.C.2.

Luminescent Products Ltd. (669,404).—Private company. September 6. Capital: £1,000 in £1 shares. To acquire, develop and exercise formulae and processes relating to luminous, luminescent, phosphorescent, fluorescent and reflective materials articled and things of all kinds and to manufacture and deal in paints, pigments, varnishes, plastics, fabrics, etc. Solicitors: Arscott Bickford's, 8 Clarges Street, W.1.

St. Helens and Veedip Sports Club Ltd. (670,397).—September 19. Capital: £100 in £1 shares (50 'A' and 50 'B'). To promote and maintain the unincorporated 'St. Helens and Veedip Sports Club' for the benefit of the employees of St. Helens Cable and Rubber Co. Ltd., and Veedip Ltd., and to acquire a sports ground at Stoke Poges, Bucks., etc. Directors: Sidney Sutton and Alexander S. Baird. Regd. office: 'Vacuna,' Stoke Poges Road, Stoke Poges, Bucks.

C. Robertson and Co. (Bristol) Ltd. (670,339).—September 19. Capital: £100 in £1 shares. To carry on the business of manufacturers of and dealers in rubber tyres, inner tubes, belting and other rubber articles and accessories, etc. The directors are: George M. C. Robertson and Mrs Kathleen M. M. Robertson, both of 4 Blakeney Road, Horfield, Bristol, 7. Regd. office: 4 Blakeney Road, Horfield, Bristol, 7.

COUNTY COURT JUDGMENTS

NOTE.—These Judgments which are supplied from the Registry of County Court Judgments, Lord Chancellor's Department, 3 Dean's Yard, London, S.W.1, are not necessarily for debt, and some may have since been satisfied. They may be for damages or otherwise, they may relate to actions bona fide contested between the parties, or they may be against defendants liable in a representative capacity and not personally; but no distinction is made on the register. A judgment does not imply inability to pay. Judgments are not returned to the Registry if satisfied in Court Books within twenty-one days.

SHIPLEY PLASTICS, 36 Upper Thomas Street, Merthyr Tydfil, Glam. Merthyr Tydfil, £43, July 25 1960.

MACROW, LTD., Ferry Lane, Hythe End, Staines, Middx., plastics moulders. Croydon, £55, July 6 1960.

L. L. BAILEY, 143 Manor Road, Stoke Newington, N.16, London, tyre factor. Shoreditch, £31, July 19 1960.

ROWLAND AND RUMENS, 56 Hamilton Square, Birkenhead, Ches., foam rubber factors. Bury, £22, July 20 1960.

LIGHTWEIGHT PLASTICS LTD., No. 2 Factory, Goodwin Road, Edmonton, N.9. Edmonton, £18, July 28 1960.

EXCELSIOR RUBBER WORKS, 11 Chapel Lane, Leeds, Yorks. Leeds, £16, July 20 1960.

TEROLE SUPPLIES LTD., Commercial Street, Oswaldtwistle, Lancs., tyre distributors. Blackburn, £65, August 4 1960.

EXCELSIOR RUBBER WORKS, 11 Chapel Lane, Leeds, 12, Yorks. Leeds, £11, August 3 1960.

G. HANNINGTON (T/A Askew Tyre Services), 64 Tavistock Road, W.11. Marylebone, £14 3s. 6d., June 15 1960.

Latest Wills

Mr Cyril Clarence Last, F.P.I., of Pine Tree Cottage, Virginia Avenue, Virginia Water, Surrey, formerly of Madeira Road, West Byfleet, Surrey, late director of Bakelite Co. and founder-chairman of the Council of the Plastics Institute, and President of the Council, 1933-34, who died on July 2, left £32,512 gross, £32,133 net value.

Mr Henry Robert Quartley, of 23 The Fairway, Aldwick Bay Estate, Bognor Regis, Sussex, one of the pioneer rubber planters in Malaya, and late chairman or director of 19 rubber companies, and a director of the Priest End (Thame) Brick and Tile Co. Ltd., and a former member of the council of the Rubber Growers' Association, who died on March 11, aged 81 years, left £114,778 15s. 6d. gross, £100,327 6s. 1d. net.

Mr Alfred Rosenbaum, of 91 Burton Road, Withington, Manchester, who served more than 40 years in the rainwear trade, and with Francastic Ltd., Manchester, since its formation, died on May 12, leaving £1,798 gross, £1,756 net value.

Increases of Capital

Beaufort Plantations Ltd. (582,710).—Planters of rubber, etc., 52/54 Gracechurch Street, E.C.3. Increased on March 17 1960 by £62,400 in 12,400 management and 50,000 ordinary £1 shares, beyond the registered capital of £100.

Hornitex (Plastics) Ltd. (606,659).—37/8 Fenchurch Street, E.C.3. Increased on February 28 1960 by £9,000 in £1 ordinary shares, beyond the registered capital of £1,000.

Plastic Formations and Components Ltd. (577,760).—194 Walsall Road, Perry Barr, Birmingham, 22B. Increased on December 1 1959 by £3,000 in £1 ordinary shares, beyond the registered capital of £3,000.

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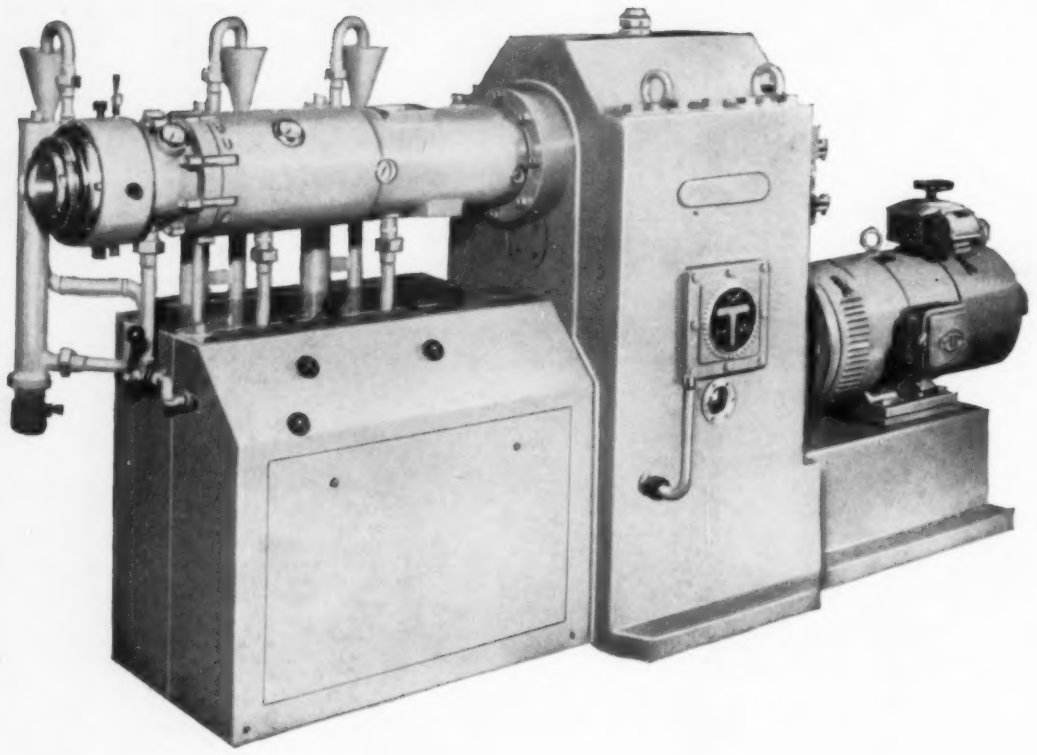

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